SPEECH MONOGRAPHS

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GRADUATE THESES — AN INDEX OF GRADUATE WORK IN THE FIELD OF SPEECH—VI*

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SECTION I

THIS edition of the graduate thesis report contains a record of 386 degrees granted in the field of speech. Of this total, 349 were granted during 1939. The list includes 30 Doctors' degrees, 180 Masters' degrees granted with requirement of thesis, and 176 Masters' degrees granted without requirement of thesis. The published record of graduate degrees granted in the field of speech now includes 1,417 Masters' degrees with thesis, 1,398 Masters' degrees without thesis, and 166 Doctors' degrees for a grand total of 2,981 degrees in all.

Table I contains a record of institutional sources of graduate school degrees in speech, and a tabulation of degrees of different types which have been granted. Indiana University is the only institution added to the list this year. Twenty-five of the thirty-three institutions from which graduate degrees have been reported granted one or more such degrees in 1939. It may be noted that Masters' degrees include Master of Arts, Master of Science, Master of Philosophy, and Master of Fine Arts degrees. Doctors' degrees include Doctor of Philosophy, Doctor of Science, and Doctor of Education. These sub-types are specifically designated in Section II of the report.

Table II contains a record of the number of degrees which have been granted in various years. Yearly percentages of the total through 1939 are also indicated. It is interesting to note that the total number of both Masters' and Doctors' degrees has remained

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TABLE I

INSTITUTIONAL SOURCES OF DEGREES GRANTED
(1939 Degrees in Parentheses)

	Master's Degrees					Doctors' Degrees		Combined Total
	With Thesis		Without Thesis		Total			
Akron		2			2			2
Alabama	(3)	4			4			4
Brooklyn	(8)	14			14			14
Carnegie	(1)	11			11			11
Columbia—T. C.		3	(50)	609	612	(6)	18	630
Cornell (1)	(3)	90			90	(1)	21	111
Denver	(10)	30			30			30
George Washington		2			2			2
Grinnell		1			1			1
Indiana	(2)	2			2			2
Illinois		4			4			4
Iowa	(39)	365			365	(8)	45	410
Louisiana	(6)	51			51	(1)	10	61
Marquette	(1)	20			20			20
Michigan			(45)	400	400	(2)	17	417
Minnesota	(5)	39	(2)	4	43			43
Missouri	(1)	3			3			3
New Mexico Normal		8			8			8
Northwestern	(8)	239	(36)	62	301	(1)	4	305
Ohio State	(6)	26			26		2	28
Ohio University		4			4			4
Ohio Wesleyan		26			26			26
Purdue	(1)	5			5			5
South Dakota	(1)	2			2			2
Southern California	(1)	146	(32)	187	333	(2)	6	339
Stanford	(9)	21			21		1	22
Syracuse		5			5		1	6
Utah	(1)	15			15			15
Washington, University of.	(2)	16			16			16
Wayne	(5)	22	(1)	6	28			28
Western Reserve (2)		1	(5)	54	55			55
Wisconsin	(25)	213			213	(5)	37	250
Yale (3)	(13)	27		76	103	(1)	4	107
Grand Totals	(151)	1,417	(171)	1,398	2,815	(27)	166	2,981

1. Thesis number 1208 in the 1938 list should have been listed as a Doctor's rather than a Master's dissertation.
2. Western Reserve granted five Masters' degrees without requirement of theses in 1938 which were not listed in the last tabulation.
3. Eight Masters' degrees granted by Yale University for 1938 are listed in this report.

fairly constant during the last three years of the report. This period represents a considerable advance over the preceding three-year period in number of degrees granted. Over 85 per cent of the Masters' and 90 per cent of the Doctors' degrees were granted during the decade from 1930 to 1939.

Table III contains a rough analysis of the subject matter studied in the theses as indicated by title and classified according to six major content areas in the field of speech. There appears to be an increase in percentage of degrees at both graduate levels in the area of "fundamentals," and at the Doctor's level in "education."

TABLE II
NUMBER OF DEGREES GRANTED WITH AND WITHOUT THESIS
TABULATED BY YEAR

YEAR	MASTERS' DEGREES				DOCTORS' DEGREES	
	With Thesis	Without Thesis	Total	Per Cent of Total	Number	Per Cent
1902	1		1	.035		
1903	1		1	.035		
1904	1		1	.035		
1906	1		1	.035		
1907	1		1	.035		
1908	3		3	.107		
1909	1		1	.035		
1912	1		1	.035		
1913	1		1	.035		
1917	1		1	.035		
1918	1	1	2	.71		
1920	3	1	4	.142		
1921	2		2	.071		
1922	7	1	8	.284	1	.60
1923	9	3	12	.426		
1924	19	6	25	.888		
1925	28	16	44	1.563		
1926	37	18	55	1.954	3	1.81
1927	43	19	62	2.202	1	.60
1928	38	25	63	2.238	5	3.14
1929	88	40	128	4.547	4	2.41
1930	79	66	145	5.151	6	3.62
1931	113	53	166	5.897	2	1.20
1932	96	101	197	7.000	11	6.61
1933	84	128	212	7.531	8	4.81
1934	78	153	231	8.206	7	4.21
1935	104	113	217	7.709	14	8.43
1936	122	142	264	9.378	21	12.63
1937	131	170	301	10.694	28	16.85
1938	172	171	343	12.185	28	16.85
1939	151	171	322	11.440	27	16.23
Totals	1,417	1,398	2,815	100.000	166	100.00

Section II of the report contains a list of theses titles classified by institutions, degrees granted, years in which the degrees were granted, and arranged alphabetically by thesis author's name within the year. The titles are given numbers in sequence from the last published list, beginning with 1374 and extending to 1583. Section III contains an index of the titles classified on the basis of the six major academic areas in the field. Doctors' dissertations are desig-

nated in this index by placing their index numbers in parentheses. Titles are listed with cross references in more than one area where such overlapping is suggested. The last lines of the index are devoted to the thesis index numbers listed in sequence by the institution granting the degrees.

TABLE III
THESES CLASSIFIED BY SUBJECT MATTER

		PREVIOUS LISTS	NEW LIST	TOTAL
Fundamentals	Masters'—Number	139	31	170
	Per cent	11.20	17.22	12.00
	Doctors'—Number	31	10	41
	Per cent	23.00	33.33	24.70
Public Speaking	Masters'—Number	201	22	223
	Per cent	16.30	12.22	15.74
	Doctors'—Number	43	7	50
	Per cent	31.10	23.33	30.16
Oral Reading	Masters'—Number	51	5	56
	Per cent	4.10	2.78	3.95
	Doctors'—Number	1		1
	Per cent	.70		.60
Dramatics	Masters'—Number	501	69	570
	Per cent	40.50	38.32	40.22
	Doctors'—Number	23	4	27
	Per cent	17.00	13.34	16.23
Speech Defects	Masters'—Number	106	19	125
	Per cent	8.60	10.55	8.82
	Doctors'—Number	17	3	20
	Per cent	12.60	10.00	12.05
Education	Masters'—Number	220	34	254
	Per cent	17.80	18.91	17.93
	Doctors'—Number	17	6	23
	Per cent	12.60	20.00	13.85
Miscellaneous	Masters'—Number	19		19
	Per cent	1.50		1.34
	Doctors'—Number	4		4
	Per cent	3.00		2.41

SECTION II

TITLES

UNIVERSITY OF ALABAMA

1939

M.A. Theses

1374. Dozier, William A., Jr., Tendencies in the American Theatre from 1928 to 1938 as Indicated by New York Productions.

1375. Morford, Daniel Leroy, Tendencies in the American Theatre from 1919 to 1928 as Indicated by New York Productions.
1376. Ray, William Thomas Ducat, Personality Differences between Debaters and Non-Debaters.

BROOKLYN COLLEGE

1939

M.A. Theses

1377. Eisenstadt, Arthur, Diagnostic Speech Tests in New York City High Schools.
1378. Fisher, Jerome, An Experimental Study of the Pleasant, Indifferent, and Unpleasant Values of Speech Sounds.
1379. Green, Harriet C., A Study of the Speech of the Hard-of-Hearing in the New York City Public Schools.
1380. Nagy, Hellen M., Sense Training for the Blind Through Dramatics.
1381. Simonson, Solomon, Restatement of Rhetoric: Its Nature, Purpose, and Place in Society.
1382. Slutzky, Julius, A Rhetorical Analysis of the Lincoln-Douglas Debates.
1383. Smith, Norma, A Survey and an Evaluation of the Speech of the Boys of the Hebrew Orphan Asylum.
1384. Weslock, Eleanor S., An Historical and Critical Survey of Apparatus and Techniques in Instrumental Phonetics.

CARNEGIE INSTITUTE

1939

M.F.A. Thesis

1385. Gill, Robert, A Production of Racine's Iphigéniea.

COLUMBIA UNIVERSITY

Teachers College

1939

Ph.D. Theses

1386. Bender, James Frederick, The Personality Structure of Stuttering with Special Reference to College Male Stutterers.
1387. Pennington, Randall Corbin, Speech in the Teaching Profession.
1388. Timmons, William Murray, Decisions and Attitudes as Outcomes of the Discussion of a Social Problem.

Ed.D. Theses

1389. Goodrich, Laurence, Living with Others.
1390. Martin, Suzanne, Development of a Speech Program at St. Mary's, Notre Dame.
1391. Wells, Charles F., The Correction of Foreign Accent.

CORNELL UNIVERSITY

1939

M.A. Theses

1392. Arlt, Phyllis Betts, A Phonological Study of the English Dialect of New York City Jews.
1393. Heilweil, David, A Translation of Drame Ancien, Drame Moderne,—Emile Faguet.
1394. Neale, John Vance, An Essay on the Rhetoric of Aristotle.

Ph.D. Thesis

1395. Bozell, Ruth Beatrice, English Preachers of the Seventeenth Century on the Art of Preaching.

UNIVERSITY OF DENVER

1939

M.A. Theses

1396. Back, Lydia, Study of Verbal Output as Related to Personality Traits.
1397. Bennett, Lura, Graduating into Citizenship, A Community centered Commencement program based on history of Raton, New Mexico.
1398. Christianson, Kenneth, Ability of Fifty Speakers to Judge Audience Reactions to Their Speech Content.
1399. Fuller, Dale, Ability of Fifty Speakers to Judge Audience Reactions to Their Delivery.
1400. Linkow, Irving, An Ex-Ray Study of the Breathing of Stutterers.
1401. Mimms, Louise, A Study of the Relations of Dominance-Submission to Participation in the Classroom.
1402. Page, Frank, An Analysis of the Conversational Behavior of High School Students.
1403. Phillips, David, All the Sorrowing, An Original Drama of Colorado Territory.
1404. Swanoe, Harold, A Study of the Personalities of Teachers of Speech.
1405. Waterman, Kenneth, The Type-Token Ratio in the Spoken Vocabulary of High School Students.

INDIANA UNIVERSITY

1939

M.A. Theses

1406. Rutherford, Kate May, A Critical Analysis of O'Neill's and Anderson's Plays Based on George Pierce Baker's Theories of Dramatic Composition.

1407. Smith, Raymond George, A Study of Certain Forms of Antithetic Emphasis in Oral Interpretation from a Recorded Speech of Difficult Prose.

UNIVERSITY OF IOWA

1924

M.A. Theses

1408. Kumler, Mary E. E., Art Principles in Dramatic Production.

1409. McGhee, Mildred M., The Acting of Ada Rehan, A Study Based on Contemporary Opinion.

1928

1410. Gailey, Marjorie, Scotch Dialect Problems Involved in a Production of Barrie's What Every Woman Knows.

1929

1411. Ward, Gladys, B., A Critique of Studies in Reading Rates, Silent and Oral.

1932

1412. Hickman, Lois V., A Comparison of Certain Sound Wave Characteristics of Stutterers and Non-Stutterers.

1935

1413. Smith, Vergil Augustus, A Project in Stage Design for Ibsen's Peer Gynt.

1938

1414. Knudsen, Orlando Stephen, The Frequency of Occurrence of Speech Sounds in the Speech of College Freshmen.

1415. Lance, Harlan E., Projects in Reading Aloud for Junior High School Students Emphasizing Voice Improvement.

1416. Lewis, Thomas Robert, The Debating Technique of Thomas Hart Benton with Special Reference to Invention.

1417. McKennan, Ruth Kathryn, Experimental Production of an Original Play.

1418. McKinzie, Helen Elizabeth Coffman, An Articulation Test for Pupils in Grade I.

1419. Porter, Harriett Von Krais, An Objective Study of the Listener in Relation to the Stutterer's Speech.
1420. Ruby, Vera Lucile, A Diagnosis of the Speech Needs and Abilities of Students of Radio Broadcasting.
1421. Shaffer, George Lewis, Sequence of Respiratory and Articulatory Movement in Relation to Phonation in Stuttering and Non-Stuttering Speech.
1422. Sherman, Dorothy Helen, An Objective Study of the Ability of Junior High School Pupils to Use Descriptive Language.
1423. Sherman, June Elaine, Analysis and Evaluation of Nine Books on Acting.
1424. Sheumaker, Marian Elizabeth, Director's Designs and Promptbook for Tortesa the Usurer, by Nathaniel Parker Willis.
1425. Skalbeck, Oliver M., A Statistical Analysis of Three Measures of Word Length.
1426. Stafford, Lloyd Albert, An Analysis of the Spoken Vocabulary and Sentence Usage of Prospective Teachers.
1427. Streeter, Donald C., A Director's Study and Promptbook of Longfellow's The Spanish Student.
1428. Wood, Margaret Louise, T. B. Macaulay's Theory of Public Speaking.

1939

1429. Barton, Fred Jackson, The Contribution of Selected Works in American Homiletics from 1860 to 1880 to the Theory of Extempore Speaking.
1430. Berwick, Naomi Hunt, Stuttering in Response to Photographs of Listeners.
1431. Brady, Lucile Milner, A Palatographic Study of Superior Articulation.
1432. Carlson, Dorothea, Saint Joan, An Actor's Problem.
1433. Clemons, Alan Barrett, A Quantitative Study of Verbal Abstracting.
1434. Colley, William Henry, Relation of Frequency to Duration of Moments of Stuttering.
1435. Connett, Maribel Hopper, Experimentally Produced Changes in the Relative Frequency of Stuttering on the Sound "T."
1436. Davee, Paul Wilson, Director's Study, Designs, Lighting and Promptbook for Ibsen's Vikings of Helgeland.
1437. Dryden, Maidia, Design and Research for a Production of Daughters of Atreus.

1438. Fear, Arthur J., The Design and Execution of the Lighting for Paul Green's Johnny Johnson.
1439. Foth, Edith Elizabeth, An Examination of the Relation of the Fundamental Concepts of Drama to the Writing of Radio Drama.
1440. Fowler, Mary Elizabeth, A Director's Study and Designs of Leacock's Fall of British Tyranny.
1441. Franke, Phyllis Elizabeth, Study of Rate of Speech in Words Per Minute and Relation to Judgments of Rate.
1442. Gallant, Marjorie, Statistical Evaluation of a Word-Fact Relating Test.
1443. Kersten, Cecil Alexander, An Analysis and Plans for a Reconstruction of the First Globe Theatre.
1444. Keys, John W., The Factors in the Training and Education of Edward Everett Accounting for his Ability as a Speaker.
1445. Knoche, Rose-Marie, Agreement Among University Freshmen in Defining Specified Words Extensionally and Intensionally.
1446. Lee, Lois Alberta, The Speech Content of Secondary School Textbooks in English.
1447. Low, Roy Glenn, Experimental Production of an Original Play.
1448. Lumpkin, Joseph Howard, A Series of Progressive Assignments for a Course in Speech in Waco High School, Waco, Texas.
1449. Marroney, Peter Ray, Producing Director's Study of Shakespeare's Richard III.
1450. Martin, Leo Austin, A Two-Year Experiment in Teaching Interpretative Reading in High School with Case Records of Individual Progress.
1451. Moore, Roberta, A Quantitative Study of Labeling Behavior of Fifth and Sixth Grade Children from High and Low Socio-Economic Levels.
1452. Morgan, Floyd Thomas, Stage Designs for Schiller's Don Carlos.
1453. Morris, John Andrew, A Study of Students Receiving Low Grades in Principles of Speech.
1454. Moskowitz, Abraham Leon, A Study of Regional Material in the Plays of Lynn Riggs.
1455. Nelson, Harold Elroy, A Comprehensive Survey of the Radio Listening Audience.

1456. Newby, Hayes A., A Study of Changes Made in Scripts by Radio Speakers While Broadcasting.
1457. Pagel, Ruth Elaine, Factors in the Speech Training and Education of Charles Sumner.
1458. Pawley, Thomas Desire, Jr., Experimental Production of Three One-Act Plays.
1459. Pittenger, Katherine Lydia, An Objective Study of Extent of Temporal Intervals Between Successive Moments of Stuttering.
1460. Schrier, Charlotte Piffer, The Public Speaking Techniques of Franklin D. Roosevelt in Selected Occasional Addresses.
1461. Slover, John Crow, A Rhetorical Study of Disraeli's Debating Technique in Selected Reform Bill Speeches of 1867.
1462. Starlin, D. Glenn, Production and Director's Promptbook of John Dryden's All for Love.
1463. Stonum, Mary Elizabeth, An Item Analysis of the Bernreuter Personality Inventory as Related to Speaking Performance.
1464. Taylor, Eugene Jackson, Factors in the Early Training and Speech Education of Robert Green Ingersoll Accounting for his Ability as an Orator.
1465. Tudor, Mary, An Experimental Study of the Effect of Evaluative Labelling on Speech Fluency.
1466. Weigand, Dorothy Louise, A Director's Designs and Promptbook for A New Way to Pay Old Debts.
1467. Williams, J. Jeanice, A Study of the Range and Variety of Roles in the Actor's Repertoire.

1932

Ph.D. Theses

1468. Henrikson, Ernest H., A Study of Breathing and Vocal Disturbances of Stutterers.
1469. Kelley, J. P., A Phonophotographic Study of Nasality in Certain Speech Sounds.

1939

1470. Cordray, Albert Thornton, A Case Study of the Speech of One Hundred College Freshmen.
1471. Curry, E. Thayer, An Objective Study of the Pitch Characteristics of the Adolescent Male Voice.
1472. Dieter, Otto Alvin, The Rhetoric of Notker Labeo.
1473. Larson, Orvin Prentiss, Invention in Ingersoll's Lectures on Religion.

1474. McIntosh, Carl Weston, Jr., A Study of the Relationship Between Pitch Level and Pitch Variability in the Voices of Superior Speakers.
1475. Pronovost, Wilbert Lucien, Jr., An Experimental Study of the Habitual and Natural Pitch Levels of Superior Speakers.
1476. Rietz, Louise Jean, The Frontier Theatre in Kansas City, Missouri, before 1900.
1477. Seigfred, Earl Covert, Analysis of Programs of Study and Demands of Teaching Positions of M.A. Graduates in Speech.

LOUISIANA STATE UNIVERSITY

1939

M.A. Theses

1478. Caughey, Mary Bentley, A Study of the Neighborhood Theatre in the United States.
1479. Geisenhof, Paul Ernest, The Pre-Civil War Oratory of L. A. C. Lamar.
1480. Lott, Dimple Alexine, The Formulation and Preliminary Standardization of Tests for High Frequency Deafness and Middle Frequency Deafness in Pre-School Children.
1481. Miller, Martha Kathleen, An Analysis of Esthetic Principles; Their Application to the Art of Interpretation.
1482. Newman, Benjamin, The Growth in Phonetic Concept and the Changes in Pronunciation Evidenced in A Comparison of John Walker's and Daniel Jones' Pronouncing Dictionaries.
1483. Polk, Lillian Graham, A Debating Program for Louisiana High Schools, Based on Current Debating League Practices.

1937

Ph.D. Theses

1484. Pardoe, Earl T., A Historical and Phonetic Study of Negro Dialect.

1939

1485. Peterson, Gordon E., The Minimum Perceptible Duration for Speech Sounds.

MARQUETTE UNIVERSITY

1939

M.A. Thesis

1486. Guinan, Alyce Josephine, A Short History of the Technique of Acting.

UNIVERSITY OF MICHIGAN

1939

Ph.D. Thesis

1487. Pflaum, G. R., Studies in the Specificity of Action of the Organs of Speech.

Sc.D. Thesis

1488. Westerman, K. N., The Vibrato—A Specific Integrational Emergence upon Fusure of Somatic Rhythms.

UNIVERSITY OF MINNESOTA

1939

M.A. Theses

1489. Drake, Francis, A Study of Exposition in American Drama from 1900 to the present.

1490. Hoke, Margaret, A Study of Pronunciation Problems among the High School Students of Delta, Colorado.

1491. Lawson, Lucie, A Study of Certain Public Speaking Practices in the Public Relation Work of the Hennepin County Tuberculosis Association.

M.S. Theses

1492. Hull, Henrietta C., A Study of the Respiration of Fourteen Spastic Paralysis Cases During Silence and Speech.

1493. Oliver, Dorothy, A Qualitative Study of the Organic Speech Mechanism Abnormalities Associated with Cleft Palate.

UNIVERSITY OF MISSOURI

1939

M.A. Thesis

1494. DeVilbiss, Ora Beatrice, A Rhetorical Criticism of the Early Pamphlets of Alexander Hamilton.

NORTHWESTERN UNIVERSITY

1939

M.A. Theses

1495. Hahn, Mildred, A Mystery Based on a Middle English Manuscript of the Fifteenth Century.

1496. Poovey, Arthur, An Analysis of the Structure of Dwight L. Moody's Sermons.

1497. Pyle, Mary Thurman, Treasure Hunt and Four Other One-Act Plays. (Original)

1498. Renn, Leone, A Study of Public Speeches for Use in the Secondary School Curriculum.
1499. Ross, Irene, An Interpretative Study of Portia in William Shakespeare's The Merchant of Venice.
1500. Rowe, Margaret, A Survey of Family Backgrounds and Health Conditions of Speech Defectives in Three Elementary Schools of Evansville, Indiana.
1501. Volkert, Erie T., A Study of the Drama of George Buchner.
1502. Zimmer, Catherine, Hearing Characteristics of a Group of High School Students with Articulatory Speech Defects.

Ph.D. Thesis

1503. Lee, Irving J., A Study of Emotional Appeal in Rhetorical Theory with Special Reference to Invention, Arrangement and Style.

OHIO STATE UNIVERSITY

1939

M.A. Theses

1504. Campbell, Genevieve Clark, An Analysis of the One-Act Play together with Three Original One-Act Plays.
1505. Hanson, Dorothy Clement, Nativity Plays in America 1900–1939.
1506. Keck, Sara Lucille, The History and Influence of Duke George II of Saxe-Meiningen and His Court Actors.
1507. O'Rourke, Kathleen Mary, The Relation of the Actor and the Playwright in France: Benhardt-Coquelin, 1875–1900.
1508. Wickersham, Maclyn Walter, Technique in Dramatic Art for the High School Actor: A Study of Scenes from well-known Plays.
1509. Zelko, Harold Philip, A Study of the Factors Influencing the Rise and Fall of Oratory During the Centuries 500 B.C. to 1939 and how far the Text of the Orations Reveals the History and Culture of its Time.

PURDUE UNIVERSITY

1939

M.S. Thesis

1510. Major, Charles C., A Comparison of the Performance of Speech Defectives and Normal Speakers on Certain Motor Tests.

SOUTH DAKOTA UNIVERSITY

1939

M.A. Thesis

1511. De Haven, Jean, An Investigation of William E. Borah's Use of Argumentation in Congressional Debate.

UNIVERSITY OF SOUTHERN CALIFORNIA

1939

M.A. Thesis

1512. Lester, H. Ward, A Comparative Analysis of the Techniques of Acting for Stage and Screen.

Ph.D. Theses

1513. Geeting, Baxter Nelson, An Investigation of Historical Vehicles of Free Oral Discussion in the United States; the Current Open-Forum Movement and Public Education; and Patterns of Forum Procedure.

1514. Wilson, Willard, The Life of the British Actor in the Eighteenth Century.

STANFORD UNIVERSITY

1939

M.A. Theses

1515. Calmenson, Benita Cyril, A Survey of Speech Correction in the Public Schools of California.

1516. Gwinn, William Madison, A Comparison of Methods for Training the Speaking and the Singing Voice.

1517. Heberer, Henry Miles, A Promptbook for a Production of Kind Lady.

1518. Linton, Louise, Marie, A Study of Ability in Discriminating Speech Sounds.

1519. Miller, Virginia Jane, A Stage History of the Plays of Alfred De Musset.

1520. Ramstad, Edith Winchester, A Study of How to Utilize the Dramatic Impulse of Children Through Extra-Curricular Activities.

1521. Rother, Harriet Vivian, A Study of Methods for Motivating Speech Education.

1522. Smith, Barbara Annette, A Pre-Directional Study of The Admirable Crichton with a View Toward Staging it in an Amateur Theatre.

1523. Whitaker, Joseph Eric, An Analysis of Current Opinion Relative to the Teaching of Dramatics in the High School.

UNIVERSITY OF UTAH

1939

M.A. Thesis

1524. Catmull, Joseph F., An Original One Act Play, Marriage by Reason.

WASHINGTON UNIVERSITY

1939

M.A. Theses

1525. Nelson, Oliver Wendell, Adjustment Through Speech.
1526. Pence, Orville Leon, A Study of the Principles of Pathetic Appeal in the Works of Certain Classical Rhetoricians.

WAYNE UNIVERSITY

1939

M.A. Theses

1527. Foltz, Barbara D., Radio as a Correlative Factor in the High School Curriculum.
1528. Pauls, Miriam D., An Analytical Study of the Hearing Loss of One-Hundred Children at the New Jersey School for the Deaf.
1529. Rickard, Paul B., An Evaluation of Various Types of Oral Presentation in Terms of Audience Comprehension.
1530. Wattles, Robert Silas, What is A Wayne Speech Student? A Statistical Study to Determine Means and Correlations of Personality Factors of Advanced Speech Students at Wayne University.
1531. Wyatt, Robert D., A Survey of Speech Activities in the Intermediate Schools Together with some Suggestive Techniques.

WISCONSIN UNIVERSITY

1939

M.A. Theses

1532. Bennett, Horace P., A Study of Transitions in Speeches.
1533. Berger, Mary Ellin, The Contributions of Women to the Theatre in the United States.

1534. Brown, Janet A., Hypothyroidism as an Etiology of Cleft Palate.
1535. Davis, Leota M., A Comparison of the Speech of Pupils on the Third Grade Level in a School with a Program of Speech Correction with Those in a Comparable School without a Program of Speech Correction.
1536. Dieckhoff, Ruth, An Experiment in Methods of Instruction In Speech.
1537. Emerson, Laura Salome, The Speech Techniques of Evangeline Booth.
1538. Flickinger, Alice, Script Writing for School Broadcasts.
1539. Haines, Ruth Ellen, A Study of Emotional Meanings in Plays Popular in Secondary Schools in 1915-1918; 1925-1928; 1935-1938.
1540. Harwell, Ruberta Louise, Interpretative Principles as Revealed by a Study of the Classicists.
1541. Hoffman, Marion E., Pedagogical Implications in the Writings of Charles Henry Woolbert.
1542. Kiser, Bonnie Kate, A Study of the Reliability and Validity of the Western Electric 4-B Audiometer Test.
1543. Lewis, Bertha Nancy, The Growth of Folk Drama in the United States.
1544. Pettit, Calvin W., Diadochocinesis of the Musculature of the Jaw During Puberty and Adolescence.
1545. Schlanger, Bernard, The Rate of Diadochokinetic Jaw Movement of Young Children in the Age Groups Seven, Eight, and Nine.
1546. Severson, Ingeborg Karine, Auditory Deficiencies Related to Losses of Acuity.
1547. Simonson, Josephine, The Relation between Intelligence and Certain Linguistic Abilities in the Elementary Grades.
1548. Snell, Alta Hedwig, A Study of Negro Poetry for its Value to the Interpreter.
1549. Varian, Donald S., A Critique for the Playgoer.
1550. Weintz, Elizabeth Emilie, The Effectiveness of Radio Broadcasts in Stimulating the Leisure Reading of High School Students.

Ph.M. Theses

1551. Cretcher, James R., The Life and Speeches of Senator John Mellen Thurston of Nebraska.

1552. Gibbs, Gwendolyn E., A Critical Study of the Constitutional Regulations Governing Declamatory Contests in the High Schools of the United States.
1553. Hansen, Howard C., The Ocular Diadochocinesis of Stutterers.
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INSTITUTIONAL SOURCES OF THESES BY NUMBER

THE RELATION AMONG KNOWING A PERSON, LIKING A PERSON, AND JUDGING HIM AS A SPEAKER

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INTRODUCTION

SPEAKERS are always being judged and rated by the members of their audiences. Unquestionably the judgment is a complex composite of a great many factors. This study attempts to answer two questions about these factors:

1. What is the relationship between the degree to which one knows a person and one's judgment of him as a speaker?

2. What is the relationship between the degree to which one likes a person and one's judgment of him as a speaker?

PROCEDURE

Eighty-one students from three classes (26, 26, and 29 students) in an elective five-hour semester course at the University of Montana, and ninety-eight Iowa State Teachers College students from four classes (26, 24, 30, and 18 students) in a required three-hour quarter course in Fundamentals of Speech, were asked to rate their classmates on three items at the end of the semester or quarter. Each rated his classmates on

1. How well he knew the person. This was on a five-point scale, ranging from "Know the person very well" through "Know the person only through contacts in class."

2. How well he liked the person. This was on a five-point scale, ranging from "Like the person very much" through "Dislike the person very much."

3. How good he thought the person was as a speaker. This was on a five-point scale, ranging from a "Very good speaker" through a "Very poor speaker."

All students were assured that their ratings would be considered as confidential and would not influence their grades or those of the persons they rated.

RESULTS

Results were compiled for each class.[1] Since no significant

[1] The author wishes to express his appreciation to Dr. J. B. Paul, Director of the Bureau of Research, for his help in compiling the statistics of this study.

differences appeared, results were grouped. Table 1 shows three relationships: between knowing and liking a person, between knowing and rating a person as a speaker, and between liking and rating a person as a speaker. In Table 2, the extremes of knowing, "only in class" and "very well", are presented so that the inter-relations among knowing, liking, and judging a person as a speaker are evident.

Table 3 shows the average difference in rating as a speaker by those who like the persons very well and those who dislike them slightly. "Dislike slightly" was used because of the small number of people who indicated a marked dislike for the speakers.

Conclusions

1. The better known students are apparently liked better. (Coefficient of Contingency .51 and .55 in Table 1 and average scores $4.7 - 3.3 = 1.4$ in Table 2.)

2. The better known students are judged to be somewhat better speakers. (Coefficient of Contingency .17 and .19 in Table 1 and average scores $3.6 - 3.2 = .4$ in Table 2.)

3. The better liked students are judged to be better speakers. (Coefficient of Contingency .35 and .30 in Table 1 and average scores $3.7 - 2.7 = 1.0$ in Table 3.)

4. There is apparently a slightly closer relationship between liking a person and judging him as a speaker when he is known only in class than when he is well known. (Coefficient of Contingency .33 and .20 in Table 2.)

TABLE NO. I

Relation Between Knowing a Person and Liking Him

Group Designation	No. of Ratings	Coefficient of Contingency	PEc	No. of PE's C is Removed from Zero
Montana.....	2193	.51	.014	36.4
Iowa.....	2320	.55	.014	39.3
Relation Between Knowing a Person and Rating as a Speaker				
Montana.....	2184	.17	.014	12.1
Iowa.....	2305	.19	.014	13.6
Relation Between Liking a Person and Rating as a Speaker				
Montana.....	2185	.35	.014	25.0
Iowa.....	2306	.30	.014	21.4

TABLE NO. II

RELATION BETWEEN KNOWING A PERSON, LIKING HIM, AND JUDGING HIM AS A SPEAKER

GROUP DESIGNATION	NO. OF RATINGS	HOW WELL KNOWN	LIKING AVE. SCORE	PEM	JUDGMENT AS A SPEAKER AVE. SCORE	PEM	COEFFICIENT OF CONTINGENCY LIKING VS. JUDGMENT AS A SPEAKER	PEC	NUMBER OF PE'S C IS REMOVED FROM ZERO
Iowa.....	1502	(1) Known only in class	M=3.2	.01	M=3.2	.01	.28	.02	14.0
Iowa.....	82	(5) Known very well	M=4.7	.06	M=3.6	.05	.23	.07	3.3
Montana....	1456	(1) Known only in class	M=3.3	.01	M=3.1	.01	.37	.02	18.5
Montana....	83	(5) Known very well	M=4.6	.05	M=3.5	.05	.20	.07	2.9
Iowa and Montana..	2958	(1) Known only in class	M=3.3	.01	M=3.2	.01	.33	.01	33.0
Iowa and Montana..	165	(5) Known very well	M=4.7	.03	M=3.6	.03	.20	.05	4.0

TABLE NO. III

RELATION BETWEEN LIKING AND RATING AS A SPEAKER

GROUP DESIGNATION	NO. OF RATINGS	HOW WELL LIKED	JUDGMENT AS A SPEAKER AVERAGE SCORE	PEM
Iowa and Montana...	466	Like very much	3.7	.03
Iowa and Montana...	155	Dislike slightly	2.7	.05

THE EFFECTIVENESS OF HUMOR IN PERSUASIVE SPEECH

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ALTHOUGH much has been written about humor, most of this literature deals with the problem of defining humor or describing the phenomenon of laughter. Research has been concerned mainly with the laughter reactions of individuals and groups. Aside from numerous interesting conjectures and opinions expressed on the basis of personal experience or observation, there is little foundation for conclusions regarding the functions of humor, particularly in its oral form. For these reasons, and because there has been disagreement among rhetoricians regarding the importance and value of humor in the speaking situation, this experimental study was undertaken. The aim was to measure objectively the effectiveness of humor in persuasive speeches where the speaker's purpose was essentially serious.

In this study the term "humor" pertains only to rhetorical humor presented orally. "Humor" is interpreted as including not only the stimulus, but the response as well; in short, humor is defined as any or all types of the comic—whether these be expressed as puns, turns of phrase or humorous anecdotes—which, uttered by a speaker, amuse a listener or group of listeners. No attempt was made to isolate and measure the effect of a specific type of humor; rather, a variety of types was included, for such is the common practice of speakers who use humor.

Procedure

The first step in measuring the effectiveness of humor thus defined, involved the preparation by the experimenter of four speeches on the subject selected—State Medicine. Two of these speeches embodied the case *For* State Medicine (hereafter referred to as Hum. For and Non-Hum. For) and two opposed State Medicine (hereafter referred to as Hum. Agst. and Non-Hum. Agst.) The two speeches on either side of the question were identical in the arguments presented, arrangement of the arguments, proportion of the speech devoted to each argument, and total length. They differed, in manuscript form, only in the fact that one version con-

tained what was thought to be humorous material whereas the other did not.

A primary problem in this experiment was to determine the results obtained by one speaker's giving each of the four speeches before various audiences. In comparing these results, the variability of the speaker factor could be kept at a minimum. As an additional check on the importance of the speaker factor the services of additional speakers were enlisted. All of the speakers were men. The experimenter gave each of the four speeches to audiences at both Purdue University and the University of Wisconsin. Two graduate students (in speech) at Wisconsin volunteered to help. One of these gave the Hum. For and Non-Hum. For speeches; the other gave the Hum. Agst. and Non-Hum. Agst. speeches. At Purdue the speeches were given by four undergraduate members of the Varsity Debating squad. Each of these speakers gave only one of the four speeches. All of the speakers memorized the speeches, and practiced the delivery until, in the opinion of the members of the speech staffs at Purdue and Wisconsin, their presentations appeared to be spontaneous, effective and reasonably comparable.

The subjects for this experiment were undergraduate students at Purdue University and the University of Wisconsin who were enrolled in classes in Speech during the second semester, 1937-38. The entire group was divided into two major sub-groups; (1) Experimental—those who were to hear the speeches, and (2) Control—those who were not to hear the speeches, but who were to mark the attitude scales at the same times that that they were marked by members of the Experimental groups. The original number of subjects was reduced by duplication, absences, and the process of equating the groups (described later) to a final total of 1016, of which 742 were Experimental subjects, and 274 were Controls. The speeches were given to the classes at the regular hours and places of meeting. Each audience heard only one speech.

The persuasiveness of the speeches was determined by ascertaining the changes in attitude toward the subject. These changes were measured by means of an attitude scale of the Thurstone type, especially prepared to measure attitudes toward State Medicine by Martin Anderson and Dr. H. L. Ewbank of the University of Wisconsin. Although two forms of the scale (Form A and Form B) were used, only one form was used at each testing time. The attitudes of all subjects were measured three times:

1st Measurement (Pre-Test)—two weeks before the speeches were given—Form A used.

2nd Measurement (Post-Test)—immediately after the speeches were given—Form B used.

3rd Measurement (Delayed-Post-Test)—three weeks after the speeches were given—Form B used.

Three scores were obtained in this way for each individual.

In addition to measuring changes in attitudes of the subjects toward State Medicine, it was further thought desirable to secure a means of measuring the reactions of the auditors to the humorousness of the speeches. As far as the subjects themselves were concerned, were the Humorous speeches considered humorous? Two methods were followed: (1) observation of their overt behavior during the presentation of the speeches, and (2) utilization of a Rating Scale by which they could indicate their impressions of the humorousness of a speech. An observer, who was in most cases the class instructor, was present in the room every time a speech was given. He was given a copy of the speech to be presented, and instructed to "write on the copy of the manuscript at the place where it occurred running notes on the behavior of the audience during the speech." The observer was specifically requested to note the points at which "laughter" occurred. The Rating Scales were originally designed to establish the differences in the humorousness of the speeches. However, in order to avoid making this purpose too obvious to the subjects, and also to obtain additional data which might prove of value, two additional scales (Interestingness and Convincingness) were used—the Humor scale being sandwiched between the other two, as follows:

A. Interestingness.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Uninteresting				mildly interesting				highly interesting		

B. Humor.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No Humor				somewhat humorous				very humorous		

C. Convincingness.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Unconvincing				somewhat convincing				very convincing		

These scales were added to Form B of the Attitude scale when that scale was used in the Post-Test.

In distributing the attitude scales, every effort was made to secure the opinions of the subjects under conditions most conducive to a frank expression of their real attitudes. By keying each individual attitude form, it was unnecessary to require the subjects to sign their names.

Results, and Analysis of the Data

1. Records kept by the observers reveal that, as far as the time of presentation of the speeches, length of speeches, deviations from the manuscript, attention of the audiences, distractions and interruptions, comments by members of the audiences, and manner of presentation are concerned, the speeches were delivered with a reasonable degree of uniformity, and the conditions under which the speeches were presented were comparable.

2. Two methods were used in validating the classification of the speeches: (1) observation of overt responses of the audiences (laughter), and (2) measurement of the impressions of the auditors regarding the humorousness of the speeches by means of the Rating Scale. Table 1 contains the data secured in these two ways. Examination of the copies of the manuscripts marked by the observers reveals that the subjects who heard the humorous speeches seldom failed to respond overtly to a humorous anecdote, but were not as consistent in their overt responses to puns, unexpected turns of phrase, and other types of humor. When the Hum. For speech was presented, the number of laughs per speech varied from 4 to 19; for the Hum. Agst. speech the number of laughs ranged from 6 to 23. According to the observers' reports there were *no* laughter responses during the presentation of the Non-Humorous speeches. These reports indicate a real difference in the two types of speeches with respect to the matter of humor.

The validity of the classification is further substantiated by examination of the data secured from the Rating Scale. The Means of the group ratings on the Humor scale were computed and are indicated in Table 1. The great disparity between the Humorous and Non-Humorous versions of the speeches revealed by the rating scale comparisons signifies that there was a real difference between the two forms of the speeches in the matter of Humor, and that, judged by the students who heard them, the Humorous speeches were humorous, and the Non-Humorous speeches were not. Analysis of the data also points to the fact that it would have been unwise to judge the reactions of the audiences by only one of the two methods

TABLE I

DATA FROM THE OBSERVERS' REPORTS AND RATING SCALES INDICATING THE RELATIVE HUMOROUSNESS OF THE FOUR TYPES OF SPEECHES.

Speech	School	Hour	Speaker	*Indv. Grps.* No. in Group	*Indv. Grps.* No. Laughs	*Indv. Grps.* Mean of Rating Scales	*Spkr. Grps.* No. in group	*Spkr. Grps.* Av. Laughs	*Spkr. Grps.* Mean of Rating Scales	*Schl. Grps.* No. in group	*Schl. Grps.* Av. Laughs	*Schl. Grps.* Mean of Rating Scales	*All Grps.* No. in group	*All Grps.* Av. Laughs	*All Grps.* Mean of Rating Scales
Hum. For	Wisc.	9	M	22	9	41.8									
		11	M	13	14	42.3	35	11+	42.0						
		2	E	28	19	67.1									
		11	E	22	11	44.3	50	15	57.1	85	13+	50.9			
	Purdue	3	E	18	4	40.8									
		11	E	19	16	72.9	37	10	57.3						
		3	R	24	8	53.3									
		9	R	23	9	59.2									
		1	R	26	7	62.1	73	8	58.3	110	9−	58.0	195	11−	54.9
Non. Hum. For	Wisc.	10	M	24	0	13.5									
		1	M	22	0	7.3	46	0	10.5						
		8	E	21	0	5.2									
		1	E	23	0	1.1	44	0	3.1	90	0	6.9			
	Purdue	11	E	21	0	3.8									
		8	E	17	0	.0	38	0	2.1						
		9	Z	21	0	4.3									
		3	Z	20	0	7.5									
		9	Z	14	0	2.5	55	0	5.0	93	0	3.8	183	0	5.3
Hum. Agst.	Wisc.	1	N	18	9	59.2									
		10	N	32	8	40.0	50	8+	46.9						
		10	E	19	23	59.5									
		8	E	19	11	56.6	38	17+	58.0	88	13−	51.7			
	Purdue	10	E	20	14	74.0									
		9	E	24	15	73.8	44	14+	73.9						
		11	H	20	7	70.0									
		1	H	19	6	65.3									
		9	H	24	7	64.6	63	7−	66.5	107	10−	69.5	195	11+	61.5
Non. Hum. Agst.	Wisc.	9	N	18	0	2.2									
		2	N	16	0	.6	34	0	1.5						
		8	E	10	0	1.0									
		9	E	22	0	5.0	32	0	3.8	66	0	2.6			
	Purdue	9	E	20	0	18.3									
		9	E	20	0	15.0	40	0	16.6						
		10	T	16	0	2.5									
		2	T	20	0	18.3									
		11	T	24	0	5.0	60	0	8.8	100	0	11.9	166	0	8.2

described above. A correlation of only .32 was found between the number of laughs reported and the humorousness of the speeches as indicated by the Rating Scales. Obviously, the number of times an

audience laughs during a speech is not always indicative of the humorousness of the speech.

On the basis of data from the Observers' Reports and the Rating Scales, we may conclude that both the Hum. For and Hum. Against speeches were humorous; that they differed distinctly in the matter of humor from the Non-Hum. speeches, which were lacking in humor; and that, therefore, the speeches were correctly classified according to type.

3. Because only one form of the attitude scale was used at a time, the "split-half" technique was followed in determining the reliabilities of the scales. 200 specimens of each form of the scale were selected at random after the scales had been marked by the subjects. The following Coefficients of Reliability (corrected by the Spearman-Brown formula) were found:

1st 100 *Form A* scales	.74
2nd 100 *Form A* scales	.77
1st 100 *Form B* scales	.88
2nd 100 *Form B* scales	.88

These results seem to warrant the conclusion that the Anderson-Ewbank Scales (Form A and Form B) used in this experiment were reliable measuring devices.

4. After all of the attitude scales had been scored, it was apparent by inspection that there was a tendency for an individual to score higher on Form B than on Form A. In order to confirm this hypothesis and to determine the amount of correction necessary, further data were secured from a group of undergraduate students at the University of Wisconsin on August 1, 1938. On that date *both forms* of the scale were submitted to a group of 200 subjects. To determine the correction figure the Mean of the scores for the entire group of 200 was computed for both forms of the scale, with the following results:

Mean for Form A scales (Mean scores)	4.54
Mean for Form B scales (Mean scores)	5.15
N — 200 Diff.	.61

Because of this evidence, the Means of all group scores for the Pre-Test were corrected by .61, the difference found to exist between the "A" and "B" forms of the scale.

5. Before the effects of the several speeches on the various groups could be compared, it was necessary to determine whether or not the

groups were comparable before the speeches were presented. Common to all the groups, of course, was the fact that they were made up of undergraduate students enrolled in Speech courses. However, it was impossible to equate all of the groups on the basis of sex, age, or intelligence without materially reducing the size of the groups. Comparison of the original (Pre-Test) attitudes of the subjects toward State Medicine seemed to offer a more satisfactory basis for determining whether or not the groups were equivalent. In order to make this comparison, the subjects were first grouped according to speech, speaker, and school. For example, the scores for the two class audiences at Wisconsin that heard speaker *M* give the Hum. For speech were combined to form one group of data; scores for the three class audiences at Purdue that heard speaker *R* give the Hum. For speech were combined to form another group, etc. Grouping the scores in this manner produced a total of 18 groups: 8 Experimental and 1 Control at both Purdue and Wisconsin.

After computing the Mean, Standard Error of the Mean, and Standard Error of the Difference of the Means for these groups on the basis of the scores made on the Pre-Test, it was possible to figure the significance of the differences between the attitudes of the various groups (on the Pre-Test) by computing the Critical Ratios $\left(\frac{\text{(Diff.)}}{\text{S. E. Diff.}}\right)$ The range for these comparisons (expressed in terms of Critical Ratios) among the Wisconsin groups was from .04 to 1.96; and for the Purdue groups the range was from .04 to 2.37. In spite of these seemingly small differences in attitude, it was thought advisable to make the groups more nearly equivalent as far as their original (Pre-Test) attitudes were concerned. This was accomplished by removing the scores for a few subjects from several groups. Those scores were taken out which pulled the group out of line with the other groups on the Pre-Test. As a result of these eliminations the total number of subjects was reduced from 1084 to 1016. Those whose attitude scales were taken out on this basis were completely removed from further consideration in this study, and the analysis from this point on is concerned only with the remaining 1016. After the groups had been equated according to the Means, as indicated above, the Standard Errors of the Means and Standard Deviations (of the distribution) were computed again. These data will be found in Table 2, which also includes the data for these same items for the Post-Test and Delayed-Post-Test scores. Again the

Critical Ratios were computed for the comparisons among all the Experimental and Control groups. Because of the fact that all of these ratios were extremely small, it is evident that the attitudes toward State Medicine of the various groups (as now constituted) at the beginning of this experiment were approximately equivalent.

6. Because of this initial equality among the groups, it is reasonable to assume that any difference between the attitude of an experimental group and the attitude of its corresponding control group on a subsequent test could be attributed to the effects of the speech heard by the experimental group. The significance of such a difference was established by computing the Critical Ratio. Since the Standard Errors of the differences between the Means were

TABLE II

MEANS, STANDARD ERRORS OF THE MEANS, AND STANDARD DEVIATIONS OF ALL EXPERIMENTAL AND CONTROL GROUPS FOR ALL THREE TESTINGS (AFTER EQUATING ON THE BASIS OF PRE-TEST SCORES)

	N	SPEAKER	SPEECH	*Pre-Test*		*Post-Test*		*Delayed-Post-Test*	
				MEAN SEM	S.D.	MEAN SEM	S.D.	MEAN SEM	S.D.
WISCONISN	35	M	HF	4.76±.17	1.00	4.44±.20	1.17	4.59±.23	1.36
	46	M	NHF	4.76±.17	1.13	4.30±.19	1.29	4.40±.16	1.11
	51	N	HA	4.76±.18	1.31	6.00±.25	1.76	5.80±.27	1.94
	34	N	NHA	4.74±.22	1.28	6.38±.31	1.83	5.87±.30	1.75
	50	E	HF	4.74±.18	1.25	3.92±.13	.93	3.96±.16	1.10
	45	E	NHF	4.75±.18	1.24	4.16±.20	1.32	4.37±.20	1.34
	38	E	HA	4.78±.18	1.11	7.22±.20	1.26	6.76±.24	1.49
	32	E	NHA	4.77±.28	1.60	6.45±.30	1.70	5.75±.32	1.82
	123	CONTROL		4.76±.12	1.31	4.65±.13	1.44	4.45±.13	1.42
PURDUE	73	R	HF	5.21±.14	1.20	4.96±.18	1.50	5.31±.18	1.52
	55	Z	NHF	5.22±.15	1.10	4.65±.17	1.23	4.85±.19	1.44
	63	H	HA	5.23±.16	1.27	7.20±.16	1.26	6.91±.18	1.40
	60	T	NHA	5.22±.18	1.42	6.84±.19	1.44	6.67±.20	1.57
	38	E	HF	5.23±.19	1.14	4.78±.21	1.28	5.08±.21	1.32
	38	E	NHF	5.23±.18	1.12	4.58±.22	1.35	4.80±.24	1.49
	44	E	HA	5.20±.19	1.25	7.20±.19	1.26	6.84±.22	1.45
	40	E	NHA	5.22±.21	1.30	7.34±.19	1.19	6.94±.20	1.26
	151	CONTROL		5.21±.10	1.26	5.33±.12	1.45	5.32±.13	1.54

used in making these computations, any derived Critical Ratio of 3.00 or more should be considered statistically significant. However, since a Critical Ratio of 2.00 indicates that there are 98 chances in 100 that the true difference is greater than zero, a C.R. of this size (2.00) or larger is now commonly considered indicative of a statistically significant difference.

The data for the comparisons between the Experimental and Control groups (expressed in Critical Ratios) are given in Table 3. The significances of the differences listed under T_2 indicate the immediate effects of the speeches. It will be noted that the attitude of every group except one changed in the anticipated direction. Section II indicates that when the data for all of the groups that heard the same type of speech at each University were combined, the significance of the differences between the Experimental and Control groups is even greater. The comparisons between the four major groups and the composite control group indicated in Section III reveal a significant change of attitude in every instance. In this same table persistence of change of attitude is indicated in the Critical Ratios listed under T_3. These figures point to the fact that although there was a regression of attitude in every case when the measurements were made three weeks after the speeches were presented, 6 out of 16 groups retained attitudes that represented statistically significant changes from their original attitudes. The fact that all of the significant differences apply to groups that heard the speeches against State Medicine may indicate that those speeches were more persuasive than the speeches For. Another explanation may lie in the fact that since the scores for the Pre-Test revealed positively skewed distributions in every group, there was more possibility of a greater change up the scale (greater hostility to State Medicine) than down the scale (more favorable to State Medicine.)

7. What was the relative effectiveness of the Humorous and Non-Humorous speeches in influencing attitudes for or against State Medicine? It is possible to compare the immediate effects of the two types of speeches (Hum. and Non-Hum.) by finding the significances of the differences between the Means for T_2 for the paired comparisons between groups that heard Humorous and Non-Humorous speeches respectively. The relative persistence of the effects of the two types of speeches was determined by making similar comparisons with respect to the data for T_3. The results of these comparisons are given in Table 4. Table 5 presents these results in diagram form. The most striking fact revealed by Table 5 is that in not one case are the differences between the two types of speeches, with respect to the immediate effects, statistically significant. If the differences that did occur are considered, it is seen that speaker E, who gave all four of the speeches, did not get better results *consistently* with one type of speech. As is indicated in Table 5, in 5 out of 8 comparisons between "speaker" groups, the Non-Humor-

TABLE III

CRITICAL RATIOS BETWEEN CONTROL GROUPS AND EXPERIMENTAL GROUPS FOR ALL THREE TESTS

I						II					III			
SPEECH	SPKR	SCH	T_1	T_2	T_3	SPEECH	SCH	T_1	T_2	T_3	SPEECH	T_1	T_2	T_3
Hum. For	M	Wis	.00	.88	− .53									
Hum. For	E	Wis	.09	3.97	2.38	Hum. For	Wis	.06	2.94	1.20				
											All Hum. For	.00	3.41	1.04
Hum. For	E	Pur	.09	2.27	.97									
Hum. For	R	Pur	.00	1.71	.05	Hum. For	Pur	.07	2.39	.47				
N.H. For	M	Wis	.00	1.52	.24									
N.H. For	E	Wis	.05	2.05	.33	N.H. For	Wis	.00	2.20	.33				
											All N.H. For	.17	4.37	.30
N.H. For	E	Pur	.10	2.99	1.90									
N.H. For	Z	Pur	.06	3.27	2.04	N.H. For	Pur	.13	4.01	2.47				
Hum. Agst	N	Wis	.00	4.79	4.50									
Hum. Agst	E	Wis	.09	10.75	8.46	Hum. Agst	Wis	.06	8.30	7.65				
											All Hum Agst	.08	13.24	11.00
Hum. Agst	E	Pur	.05	8.31	5.94									
Hum. Agst	H	Pur	.11	9.35	7.16	Hum. Agst	Pur	.06	11.00	8.12				
N.H. Agst	N	Wis	.08	5.15	4.34									
N.H. Agst	E	Wis	.03	5.50	3.77	N.H. Agst	Wis	.05	6.91	5.31				
											All N.H. Agst	.15	11.80	9.24
N.H. Agst	E	Pur	.04	8.93	6.78									
N.H. Agst	T	Pur	.05	6.71	5.65	N.H. Agst	Pur	.06	9.29	7.37				

(Note: the minus sign (−) indicates that the attitude change was in a direction opposite to that anticipated.)

ous speeches changed attitudes slightly more than the Humorous speeches; and in the remaining 3 comparisons, the Humorous speeches were somewhat, but not significantly, more effective.

The relative persistence of the effects of the two types of speeches, which is also indicated in Tables 4-5, was found to correspond very closely with the results for the previous comparisons. In not one case was one type of speech more effective than the other, as far as statistical significance is concerned.

8. Since the two types of speeches were about equally persuasive, the questions that now arise are: Was one type more interesting to the auditors than the other? Did one type seem to be more convincing than the other? It will be remembered that after the speeches had been presented, and after the subjects had marked the attitude scales, the members of each audience were requested to indicate, by

TABLE IV

DIFFERENCES BETWEEN THE MEANS; STANDARD ERRORS OF THE DIFFERENCES; AND CRITICAL RATIOS FOR COMPARISONS BETWEEN EXPERIMENTAL GROUPS ON THE POST-TEST AND THE DELAYED-POST-TEST

	A		B		T_2			T_3		
	SPKR	SPEECH	SPKR	SPEECH	DIFF.	SEDIFF	C.R.	DIFF.	SEDIFF	C.R.
WISCONSIN	M	Hum. For	M	N.H. For	− .14	.276	.51	− .19	.280	.68
	E	Hum. For	E	N.H. For	+ .24	.239	1.00	+ .41	.256	1.60
	M	Hum. For	E	Hum. For	− .52	.239	2.18	− .63	.280	2.25
	M	N.H. For	E	N.H. For	− .14	.276	.51	− .03	.256	.12
	N	Hum.Agst	N	N.H. Agst	− .38	.398	.95	− .07	.404	.17
	E	Hum.Agst	E	N.H. Agst	+ .77	.361	2.13	+1.01	.400	2.53
	N	Hum.Agst	E	Hum.Agst	−1.22	.320	3.81	− .96	.361	2.66
	N	N.H. Agst	E	N.H. Agst	− .07	.431	.16	+ .12	.439	.27
PURDUE	R	Hum. For	Z	N.H. For	− .31	.248	1.25	− .46	.262	1.76
	E	Hum. For	E	N.H. For	− .20	.304	.66	− .28	.319	.88
	R	Hum. For	E	Hum. For	− .18	.277	.65	− .23	.277	.83
	Z	N.H. For	E	N.H. For	− .07	.278	.25	− .05	.306	.16
	H	Hum.Agst	T	N.H. Agst	+ .36	.248	1.45	+ .24	.269	.89
	E	Hum.Agst	E	N.H. Agst	− .14	.269	.52	− .10	.297	.32
	H	Hum.Agst	E	Hum.Agst	.00		.00	+ .07	.284	.25
	T	N.H. Agst	E	N.H. Agst	− .50	.269	1.86	− .27	.283	.95

(The Means for the groups in column A are compared with the Means for the paired groups in column B. The plus sign preceding a difference indicates that the difference in the change of attitude in the anticipated direction was greater in the A group than in the B group; the minus sign indicates that the change was greater in the anticipated direction in the B group than in the A group.)

checking a Rating Scale, their estimates of the Interestingness, Humorousness and Convincingness of the speech they had just heard. The analysis of the Humorousness Scale data has already been pre-

TABLE V

ILLUSTRATING THE RELATIVE EFFECTS OF THE HUMOROUS AND NON-HUMOROUS SPEECHES ON CHANGES OF ATTITUDE

	Immediate Effect Hum. N.Hum.			Persistence Hum. N.Hum.		
For (Wis).....		M → M	(.51)		M → M	(.68)
	(1.00)	E ← E		(1.60)	E ← E	
For (Pur).....		E → E	(.66)		E → E	(.88)
		R → Z	(1.25)		R → Z	(1.76)
Agst (Wis).....		N → N	(.95)		N → N	(.17)
	(2.13)	E ← E		(2.53)	E ← E	
Agst (Pur).....		E → E	(.52)		E → E	(.32)
	(1.45)	H ← T		(.89)	H ← T	
For (Wis) Composite	(.54)	←		(.89)	←	
For (Pur) Composite		→	(1.41)		→	(1.95)
Agst (Wis) Composite		→	(.22)	(1.37)	←	
Agst (Pur) Composite	(.87)	←		(.44)	←	
All For.....		→	(.92)	(.71)	←	
All Agst.....	(.67)	←		(1.07)	←	

(The arrows point toward the speech that was more persuasive. The numbers in the parentheses are the Critical Ratios.)

sented. Table 6 shows the Means of the various groups for the Interestingness and Convincingness Scales. It may be seen that in the case of the "speaker" groups neither the Humorous nor the Non-Humorous speeches were consistently more interesting or more convincing as far as the auditors were concerned. Table 6 also illustrates the comparisons between the Convincingness and Interestingness of the speeches as rated by the auditors, and the Convincingness of the speeches as revealed by the changes of attitude effected. Note that among the speaker groups the more persuasive speech was in 6 comparisons out of 8 also rated more interesting. In every comparison the more persuasive speech was also rated more convincing by the auditors.

9. Did positive correlations exist between scores on the Rating and Attitude Scales? Did an individual who changed his attitude in the anticipated direction also tend to rate the speech as Interesting, Convincing, and Humorous? In answering these questions, four scores were assembled for each Experimental subject: from the Rating Scales, his ratings of the speech that he heard on Interestingness, Humorousness, and Convincingness; from the Attitude Scale, his change of attitude. With such data it was possible to find the correlations by means of Sheppard's Method of Unlike Signs. Examination of the data thus produced discloses that as far as those who heard the Humorous speeches were concerned, there was little rela-

tionship between a subject's change of attitude and the way he rated the speech on Interestingness or Humorousness, or between his rating of the speech on Humorousness and his rating on Convincingness. In the case of the Non-Humorous speeches there were low correlations between Interestingness and the change of attitude

TABLE VI

ILLUSTRATING THE COMPARISONS BETWEEN HUMOROUS AND NON-HUMOROUS SPEECHES WITH RESPECT TO "INTERESTINGNESS," "CONVINCINGNESS," AND PERSUASIVENESS (IMMEDIATE EFFECT).

			Speaker Groups					
			Hum. Mean	N.H. Mean	Hum. Mean	N.H. Mean	Hum. Mean	N.H. Mean
Interestingness								
For	WIS	M–M	75.0 →	83.4	82.2 ←	82.6		
		E–E	87.2 ←	81.7			77.4 →	78.0
	PUR	E–E	76.8 →	75.5	73.8 →	73.9		
		R–Z	72.3 →	72.2				
Against	WIS	N–N	78.7 →	79.6	81.8 →	81.8		
		E–E	85.9 ←	84.2			80.9 ←	80.9
	PUR	E–E	82.3 →	82.9	80.2 ←	80.3		
		H–T	78.7 ←	78.5				
Convincingness								
For	WIS	M–M	68.6 →	77.8	76.7 ←	78.9		
		E–E	82.4 ←	80.0			76.5 →	77.1
	PUR	E–E	73.8 →	76.8	70.2 →	75.4		
		R–Z	68.4 →	74.4				
Against	WIS	N–N	59.0 →	65.2	65.1 →	64.8		
		E–E	73.2 ←	64.4			74.1 ←	74.9
	PUR	E–E	79.0 →	81.4	79.8 ←	79.8		
		H–T	80.4 ←	78.7				

(Under the column labelled "Spkr" the first letter refers to the speaker who spoke to the group whose rating scale score (Mean) is given in the left-hand column under "Speaker Groups." The second letter (speaker) is paired with the group whose score is indicated in the right hand column. The arrows point toward the speech which was found to be more persuasive according to the analysis of the attitude scales.)

effected. The least reliable correlations existed between change of attitude and Interestingness, change of attitude and Humorousness, Convincingness and Humorousness, and Interestingness and Humorousness. The highest correlations were between ratings on the Convincingness scale, and the ratings on the Interestingness scale and the actual change of attitude effected. Apparently these subjects considered the speeches convincing without any regard as to whether they were humorous or not, and the evidence also seems to indicate

that the subjects were fairly able to judge their own shifts of attitude.

Conclusions

The results obtained in this experiment seem to justify the conclusions listed below:

1. Attitudes toward State Medicine were changed *significantly,* in the anticipated directions, as a result of *both* Humorous and Non-Humorous speeches.

2. There were no significant differences between the Humorous and Non-Humorous speeches in the degree of effectiveness as far as the *immediate effects* were concerned.

3. The Humorousness of "humorous material" depends on some variables in addition to the material itself.

4. Although a regression in attitudes occurred, there is evidence that changes in attitudes resulting from both Humorous and Non-Humorous speeches *persisted* three weeks after the speeches were presented.

5. There were no significant differences between the Humorous and Non-Humorous speeches as far as the *persistence* of the change of attitude was concerned.

6. Humorous and Non-Humorous speeches were judged about equally interesting and equally convincing to the auditors.

7. There is little likelihood that an auditor's appraisal of the humorousness of a speech will bear a direct relation to his estimate of its interestingness or convincingness, or to the actual change of attitude which the speech produces. There is a greater probability that his estimate of the interestingness and convincingness of a speech and the actual change of attitude will be more highly correlated.

Application of the Conclusions

How do the results of this study apply to the teaching of speech? Tentatively, the evidence indicates that the optimism of those who stress the importance of humor in persuasive speeches is not exactly confirmed. The same humorous material may vary in humorousness when it is presented by different speakers, and even by the same speaker, as these results showed, and furthermore a persuasive speech without humorous material will probably get just about as good results as one which has humorous material in it, *if humorous material is the only difference between the two speeches.* There is probably no good reason why all speech students should be required to use

humorous material in their persuasive speeches—no reason why Humor should be set up as a primary requisite for effectiveness in persuasive speaking.

On the other hand the pessimism of those who decry the use of humor in persuasive speaking—particularly if the speech has a serious purpose—is not warranted on the basis of the results of this investigation. Humorous speeches were about as effective as the Non-Humorous speeches in every case—even though the subject, State Medicine, was about as serious as could have been selected.

In short, if any significance is to be attached to the results of this experiment, it would probably be better for the speech teacher to avoid laying down a blanket rule—either insisting upon *or* completely rejecting the use of humor in *persuasion.*

THE RELATIVE EFFECTIVENESS OF THREE FORMS OF RADIO PRESENTATION IN INFLUENCING ATTITUDES

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THIS investigation was undertaken to determine, under controlled experimental conditions, the relative effectiveness of three forms of radio presentation, the straight talk, the complete dramatization, and the combined talk and dramatization, in influencing attitudes. Attitude is considered to be the predisposition or set which results in a given response. The subjects for the experiment were eleventh and twelfth grade high school students and a few college students. With reference to these forms of presentation, and these groups of listeners, the study dealt with the following problems:

1. Do three radio programs, equivalent in every respect, except for a difference in form of presentation, differ significantly in their effect on attitudes?
2. Is the form of presentation an important factor in radio programs designed to influence attitudes?
3. Which form of presentation do high school and college students prefer to hear?
4. Can one fifteen-minute radio program, aimed at shifting an attitude, shift that attitude significantly?

The experiment was designed with the interests of two types of broadcasters in mind; those who use radio to reach educational objectives, and those broadcasters, other than educators, who employ radio for purposes of persuasion. In this latter group we may class advertisers, political speakers, religious speakers, promoters of charity campaigns, and all others whose primary aim is to influence the beliefs and actions of listeners.

One of the judgments a broadcaster must make is to select a form in which to present his material; thus it is important to determine objectively the relative values of various forms of presentation with relation to specific aims and specific audiences. This study investigates one area of this general problem.

These three forms were selected for comparison because they figure prominently in broadcasts both by educators and persuaders. In addition, they are basically different. The talk maintains direct audience contact, the dramatization, indirect; the suggestion used in

dramatizations is less direct than that of talks; dramatization employs more variations in presentation; and the inherent emotional appeal of the dramatization is probably greater than that of the talk. The third type, combined talk and dramatization, is intermediate between the other two in these respects.

The plan of the experiment involved the comparison of these three forms of presentation in similar situations and with similar groups of listeners. Scripts in the three forms were written to influence attitude in a specific direction with regard to the German people, treatment of criminals, and freedom of speech and press, with three scripts on each subject. Care was taken to match the scripts in each set in arguments, order of presentation of arguments, vocabulary, syntax, information, and balance of emotional and logical appeal (other than that inherent in the difference in form). In addition, twenty-one people, with experience in radio, read and evaluated the scripts. Their judgment was that the three scripts in each set were approximately equal in quality. Recordings of the programs were made at station WHA and again care was taken to control variables. The consensus of opinion of ten people who heard the recorded programs indicated that the only important variations among them were differences in form.

Since Roskelly [1] and Zimmerman [2] have shown experimentally that opinion is a valid indicator of the type of attitudes involved in this study it was assumed that when opinions were measured the attitudes underlying them were also measured. Three scales were constructed according to a technique devised by Likert.[3] Each scale contained thirty statements of opinion, fifteen favorable to the issue in question, and fifteen unfavorable. Subjects responded to the statements along a five point scale ranging from complete agreement to complete disagreement. The statements of opinion were carefully matched with the experimental scripts to make certain that the same attitudes were involved. During the course of the experiment the scales were found to be internally consistent and their reliabilities exceeded .90.

Three separate experiments make up this study: one at Detroit,

[1] Roskelly, R. W. "Attitudes and Overt Behavior." *Ph.D. Thesis*, The University of Wisconsin, (1938).

[2] Zimmerman, C. C. "Types of Farmer's Attitudes." *Social Forces*, V, (1927), 591–596.

[3] Likert, R. "A Technique for the Measurement of Attitudes." *Archives of Psychology*, No. 140, (1932).

Michigan, with 305 eleventh and twelfth grade high school students who served both as experimental and control subjects; one at Shorewood, Wisconsin with 221 experimental and 80 control subjects of the same grade; and an experiment at the University of Wisconsin with college undergraduates, 89 in the experimental groups and 58 in the control. All of the high school subjects were students in the social studies; the college subjects were students in beginning speech classes.

In all experiments the administration of a pre-test, made up of the three attitude scales combined, was the first step in the experimental procedure. The playing of the recordings followed next. In Detroit each of nine classes heard one recording only, which was followed immediately by a post-test. Although the subjects heard only one program they responded to items from two of the scales. In Shorewood and Wisconsin each class heard three programs in the three different forms, with the order varied from class to class. A post-test on all the issues was given at the next meeting. Two weeks later a delayed post-test was administered in all three experiments to determine the persistence of any attitude changes accomplished by the programs. Control classes responded to the attitude scales three different times but heard no recordings. All subjects registered their preference for one of the forms of presentation during the testing periods. Each time the opinion scales were administered an effort was made to obtain as honest an expression of opinion as possible.

The recordings were played over good quality public address systems. In Detroit only the loudspeaker was seen by the audience. In Shorewood and Wisconsin the nature of the equipment made it necessary to reveal the turn table and recording also. In all cases, however, the reception of the recordings closely approximated the radio listening situation.

Standard statistical methods were employed to analyze the data. A series of correlations was calculated to determine the relationship between attitude shift and age, sex, intelligence, year in school, and pre-score. The latter was the only factor related to any significant degree with the attitude shift. For this reason, subjects from group to group were matched on pre-score alone, within the standard error of the score. The next step was to calculate mean shifts of attitude in groups hearing the three forms of presentation. These shifts were then compared and the significance of the differences determined. Data in the Shorewood and Detroit experiments were first analyzed separately and then combined. The Wisconsin data were kept separate. To supplement this group method of analysis, shifts in attitude

of individual subjects were also measured. This was done by computing the per cent of the entire group shifting one standard error of the score, and three standard errors of the score.

The analysis of the data has revealed certain answers to the questions with which this project began. These will be summarized as the major conclusions of the study. In addition, the investigation of certain other problems, not directly related to the chief aims of the experiment, was made possible by the type of data collected. The results of these analyses will be listed as minor conclusions.

Conclusions will be worded in the present tense when the data provide adequate assurance that the same results would be found in similar situations. When there is slight indication of significance, the conclusions will be worded in the past tense as a report of what happened in this particular experiment.

In applying the conclusions it must be remembered that they are strictly limited by the nature and conditions of the investigation.

Major Conclusions

1. The radio dramatization is most effective, the combined form next, and the talk least effective in influencing the attitudes of eleventh and twelfth grade *high school* students.

The difference in effectiveness between the talk and the drama, measuring immediate shift, is statistically significant as indicated by a critical ratio of 4.97. In all other comparisons the chances are not less than 94 in 100 that the differences are greater than zero. Since other variables were controlled, we may attribute this difference to the variations in form of presentation. The fact that consistent results were obtained in two different experiments and with two types of analyses, supports the conclusion that the three forms of presentation do differ in their power to influence the attitudes of high school students. The same order of effectiveness applies in bringing about immediate shifts in attitude, and retained shifts as measured after a period of two weeks. Despite the probable significance of all of these differences, however, they were in no case very great. This indicates that, although form of presentation is a factor in influencing attitudes, it is not an important factor.

2. The three forms of presentation were equally effective in influencing the attitudes of *college* students.

The smaller number of subjects in this group does not permit a generalization. The three forms of presentation may or may not differ in their effectiveness with respect to college students as a whole.

Conflicting results were obtained with group and individual analyses and the differences, indicated by either method, were very small.

3. The combined form is preferred by a large majority of *high school* students, the dramatization is second choice, and the talk is liked least of all.

4. The majority of *college* students prefer the combined form, but their second choice is the talk, while the dramatization is liked by the smallest number.

5. A fifteen minute radio program can shift the attitudes of *high school* and *college* students significantly, and this influence persists to a significant degree for a period of at least two weeks.

The critical ratios of differences between the attitudes of control subjects who heard no programs, and experimental subjects, are greater than three, indicating statistical significance. This conclusion confirms the findings of other investigators who found that attitudes of high school and college students do change significantly as the result of short periods of persuasion.

Minor Conclusions

1. The relationship between intelligence and the shift in attitude of *high school* students is negligible.

The correlations found, although extremely low, are all negative, indicating a slight tendency for the more intelligent to be shifted less by persuasion than those of lower intelligence. Other investigations confirm this conclusion.

2. The attitudes of *high school* boys and girls were shifted to approximately the same extent by the programs.

3. *College* women tended to shift attitude more readily than men. Knower [4] and Jenness [5] also found this to be true in their investigations.

4. The attitudes of *high school* students, after changing as the result of persuasion, tend to regress toward the original position.

Although the influence of the radio programs was still apparent to a significant degree after a two week period, there was a return in

[4] Knower, F. N. "Experimental Studies in Changes in Attitudes. Some Incidence of Attitude Changes," *Journal of Applied Psychology,* XX, (1934), 114–127.

[5] Jenness, A. "The Role of Discussion in Changing Opinion Regarding a Matter of Fact," *Journal of Abnormal and Social Psychology,* XXX, (1933), 279–296.

the direction of the original attitude. The investigations of other experimenters confirm the fact that this regression takes place.

5. The attitudes of *college* students, once changed, regressed less than those of *high school* students.

In two cases the retained shift in attitude was greater than the immediate shift. However, the findings of Lull [6] and others show that regression does take place with the passage of time.

6. The attitudes of *high school* students are shifted more easily than those of *college* students.

Comparing immediate shifts, this difference is significant. With retained shifts the chances are 98 out of 100 that the difference is not due to chance. Apparently the difference in age and education results in greater resistance to persuasion.

7. *High school* students who heard only one program made slightly greater shifts in attitude on the one issue than those who heard three programs.

8. *College* students were more liberal in their original attitudes toward the three issues than *high school* students.

9. *High school* students of higher intelligence were more liberal in their original attitudes than those of lower intelligence.

10. Programs heard in the first and third positions were more effective in shifting the attitudes of *high school* students than those in the second position.

The Application of the Results

How should the results of this study affect the activities of the radio broadcaster? The evidence seems to justify the statement that when the aim is to influence attitudes, and when the audience is made up of high school students listening in classrooms, the broadcaster may expect greatest success with the dramatization, with the combined form and talk following in that order. This is true whether his interest is in immediate changes, or changes that will persist. In other words, the order of effectiveness of the forms is the same when the aim is to influence an attitude operating in a situation tomorrow, or in a situation taking place two weeks hence.

This application of the results is permitted, of course, only if all other factors are equal. The superiority of the dramatization is by no

[6] Lull, P. E. "An Objective Study of the Effectiveness of Humor in Persuasive Speeches," *Ph.D. Thesis.* The University of Wisconsin, (1939).

means indicated in every instance. A poor dramatization is probably less effective than a good talk.

How important is the advantage gained by using the dramatization? The results show that the advantage is not great. The broadcaster needs to carefully evaluate the situation in which he finds himself. If his facilities permit the presentation of dramatizations which can be produced as easily and as well as talks, then their use is indicated. However, the small advantage gained by using dramatizations does not seem to justify a great deal of extra effort or expense.

As far as the results of this study show, the broadcaster needs to be little concerned with choosing among the three forms of presentation when the listeners are college students.

Although the study indicates that both high school and college students prefer to hear the combined form, when the aim is to influence attitude, this preference is apparently unimportant. With respect to other objectives, however, such as developing new interests or adding to information, the preferences of the listeners may be highly important.

One word of warning is necessary with respect to the application of the results of this study. The investigation has not shown that one form of presentation is "better" than another form, but only better in a certain situation. With different aims, and different audiences, the order of effectiveness of these forms may be radically changed.

THE PITCH CHARACTERISTICS OF THE ADOLESCENT MALE VOICE[1]

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IT is the purpose of this study to investigate objectively the pitch characteristics of the male voice during the pre-adolescent, adolescent, and post-adolescent stages of development. Interest in this problem arises from observation of the so-called voice "breaks" which occur as one of the manifestations of adolescence in the male. In addition to these anomalies, certain general changes in the pitch characteristics of the voice occur during the period of the growth of the larynx. For example, it is commonly stated from general and clinical observation, that the voice of the male drops an octave in pitch over the period of voice change.

A careful investigation of the literature of speech, psychology, music and medicine has failed to reveal any objective comparative studies concerned with the development of the adolescent voice during this period of change. Furthermore, no objective evidence has been found to indicate the nature or the extent of voice "breaks" or to localize the point on the musical scale from which these breaks originate. This study, therefore, represents an attempt to trace the development of the pitch characteristics of the male voice before, during, and after the time of change of voice and to examine intensively any "breaks" found in the voices of the subjects studied.

I. Procedure

In order to secure subjects (a) who had not yet arrived at the age of voice change, (b) who were undergoing voice change, and (c) who had passed through the period of voice change, groups of pre-adolescent (10 years), adolescent (14 years), and post-adolescent (18 years) males were chosen for investigation. The labor involved in the acoustical measurements described below necessitated the use of small groups. Six subjects were selected at each age level.

In the selection of the subjects five factors were controlled as

[1] The main content of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Speech, in the Graduate College of the State University of Iowa, August, 1939. It is part of a research program in Experimental Phonetics being carried out under the direction of Professor Grant Fairbanks.

rigidly as possible, *viz.*, (1) physical size, (2) chronological age, (3) reading comprehension, (4) speaking ability, and (5) intelligence. Subjects were selected to represent a group as homogeneous as possible and also as typical of the median performance of the group achievement level. The ten-year-old group was chosen from students in the fourth grade of the public school system, the fourteen-year-old subjects from the seventh and eighth grades of the public school system, and the eighteen-year-old group from college freshmen.

The ten-year-old subjects presented the following ranges on the control factors: Height, 52–55 inches, with a mean of 53.5 inches; weight, 62–69 pounds, with a mean of 66.3 pounds; chronological age, 118–122 months, with a mean of 120.3 months; reading comprehension,[2] 3.5–4.4 reading grades, with a mean of 3.9 reading grades; intelligence,[3], 97–108, with a mean I.Q. of 101.

The fourteen-year-old subjects presented the following ranges on the control factors: Height, 59–61 inches, with a mean of 60.2 inches; weight, 97–110 pounds, with a mean of 102.2 pounds; chronological age, 167–172 months, with a mean of 169.8 months; reading comprehension, 7.7–8.8 reading grades, with a mean of 8.3 reading grades; intelligence, 97–110, with a mean I.Q. of 103.7.[4] It should be noted that the chronological age of these subjects is similar to that of the subjects considered in the work of *Jerome*,[5] who found a range of 62 months at a mean chronological age of 166.75 months for his "voice change" subjects. This evidence provides the only objective basis available for choosing a group of subjects who are most likely to be undergoing change of voice.

The eighteen-year-old subjects were selected from the 1200 freshmen registered in the Principles of Speech course at the State University of Iowa during the first semester of the academic year 1938–39. These subjects presented the following characteristics: Height, 66–70 inches, with a mean of 68.2 inches; weight, 131–148 pounds, with a mean of 139.3 pounds; chronological age, 213–222

[2] *Gates Silent Reading Test, Advanced Examination, Grades 3—8, Form I.* Bureau of Publication, Columbia University, New York, (1927). The scores are expressed here in terms of school grade achievement.

[3] *Otis Self-Administering Tests of Mental Ability, Intermediate Examination, Grades 4—9, Form B.* World Book Company, Yonkers-on-Hudson, New York, (1922).

[4] Examinations cited above.

[5] Jerome, E. K. "Change of Voice in Male Adolescents." *Q. J. Sp.*, 23, (1937), 648–653.

months, with a mean of 216.7 months. The mean composite score and mean reading comprehension score of the group on the Iowa Freshmen Qualifying Examinations [6] were at the 52nd percentile, with a range from the 42nd to the 58th on the composite, and from the 42nd to the 59th on reading comprehension. The speech scores received by these students on *Barnes'* [7] rating scale ranged from 43–58 with a mean of 49.5, the mean score for the entire freshman class being 52.

For the factor of speaking ability, each of the subjects was examined to be certain that he did not present any marked deviations from what constituted the typical speech for his age level. The grade teacher of the individual subjects stated that the speech of the ten- and fourteen-year-old subjects was not atypical for the age level of the group.

Oral readings of the test materials by the eighteen subjects were recorded phonographically. Only recorded performances free from defects in pronunciation, word omission or substitution were used in the study. The reading material used was the 55-word passage used in the studies of *Pronovost,*[8] *McIntosh*[9] *and Snidecor.*[10]

Using the phonophotographic technique originated by *Metfessel,*[11] modified by *Simon* [12] and *Lewis and Tiffin* [13] and electrified by *Cowan,*[14] pitch curves were plotted from frequency measurements, and measures of pitch were computed. The examples of voice "breaks" found in the records were analyzed separately by means of careful wave-to-wave measurements.

[6] *University of Iowa Qualifying Examinations, Bureau of Educational Research and Service,* The State University of Iowa, Iowa City, (1938).

[7] Barnes, H. G. *Speech Handbook,* Athens Press, Iowa City, (1938).

[8] Pronovost, W. "An Experimental Study of the Habitual and Natural Pitch Levels of Superior Speakers," *Ph.D. Dissertation,* State University of Iowa, (1939).

[9] McIntosh, C. W., Jr. "A Study of the Relationship Between Pitch Level and Pitch Variability in the Voices of Superior Speakers," *Ph.D. Dissertation,* State University of Iowa, (1939).

[10] Snidecor, J. C. "Experimental Studies of the Pitch and Duration Characteristics of Superior Speakers," *Ph.D. Dissertation,* State University of Iowa, (1940).

[11] Metfessel, M. "Techniques for the Objective Study of Vocal Art," *Psychol. Monog.,* 36, (1927), 1–40.

[12] Simon, C. T. The Variability of Consecutive Wave Lengths in Vocal and Instrumental Sounds, *Psychol. Monog.,* 36, (1927), 41–83.

[13] Lewis, D. and Tiffin, J. A Psychophysical Study of Individual Differences in Speaking Ability, *Ar. Sp.,* 1, (1934), 43–60.

[14] Cowan, M. "Pitch and Intensity Characteristics of Stage Speech," *Ar. Sp.* Suppl., (1936).

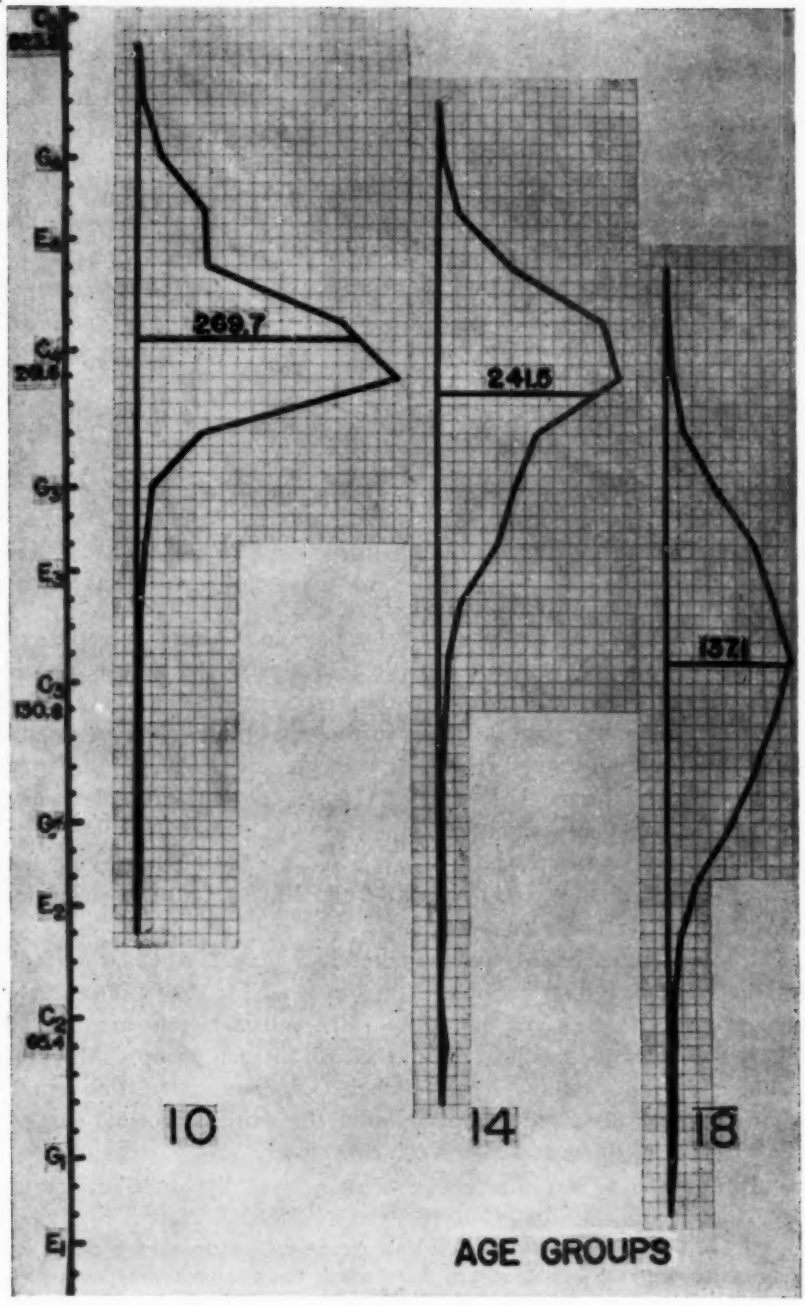

FIGURE I

Frequency distributions of pitches used for each of the three age groups. Tones of the musical scale are plotted along the ordinate; the abscissa, in the case of each group, is the percentage of the total measured pitches.

TABLE I

GENERAL MEASUREMENTS OF VOCAL PITCH

	Age Groups		
	10	14	18
Median Pitch Level [c.p.s.]	269.7	241.5	137.1
Nearest Musical Tone	$C\sharp_4$	B_3	$C\sharp_3$
Median Pitch Level*	24.35	23.39	18.42
Mean S. D. [tones]	1.19	1.70	1.79
Mean Phonational Range [tones]	2.2	3.0	3.4
Mean Extent of All Inflections [tones]	1.9	2.4	2.4
Mean Extent of All Shifts within Phrases [tones]	1.7	1.9	2.0
Mean Extent of All Shifts between Phrases [tones]	3.3	4.3	4.8
Mean Rate of Pitch Change**	7.7	12.4	13.2
Mean Rate of Pitch Change During All Inflections**	12.9	17.6	17.0
Mean Number of Changes in Direction of Pitch Per Second			
During Phonation Only***	6.2	7.0	6.7
Including Shifts***	5.8	7.1	6.5

* Tones above 16.35 c.p.s.
** Tones per second
*** All extents

II. RESULTS

1. *Standard Measures of Pitch.*[15]

The most striking feature of Table I is the difference of approximately one octave between the pitch levels of the fourteen- and eighteen-year-old subject groups, the respective values being 241.5 and 137.1 c.p.s.[16] It will be noted further that the pitch levels of the ten- and fourteen-year-old subjects coincide very closely, 269.7 and 241.5 c.p.s., in the neighborhood of $C\sharp_4$ on the musical scale, while that of the eighteen-year-old group is close to $C\sharp_3$. If the subjects of this study typify their respective age levels, the data indicate that the major shift in pitch occurs between 14 and 18 years, a somewhat later age than is commonly supposed.

These differences also may be noted in Figure I, which is a graph of the frequency distributions of pitches used for each of the three age groups. In this graph, tones of the musical scale are plotted along the ordinate; the abscissa, in the case of each group, is the percentage of the total measured pitches. Observation of this graph shows that the distributions approximate the shape of normal curves, and that the medians and means coincide closely.

In addition to the differences in pitch level, the distributions of

[15] The pitches used by the individuals were combined to form a composite distribution for each of the groups from which the measures were computed. In Table I, however, the S.D.'s are means of the six individual values for the subjects in each group.

[16] Cycles per second.

Figure I show a greater variability of pitch usage for the fourteen-year-old and eighteen-year-old groups than for the ten-year-old group. A comparison of the standard deviations presented in Table I also will show this difference.

In summary, it may be seen from Table I and Figure I that in the subjects studied the major difference in pitch level occurs between ages fourteen and eighteen; that this shift in pitch level is approximately one octave in extent; and that the ten-year-old subjects tend to be less variable in pitch usage than the other two age groups.

In order to give a quantitative expression to the phenomenon noted above in connection with both Table I and Figure I, that the distribution of pitches used at ten is less variable than at the two older age groups, and also to present a clearer idea of the "functional" pitch range, values of the extent in tones of median percentages of pitches used were computed. In order to compute these values, each individual case was considered and the extent in tones which included the median ten per cent, 20 per cent, 30 per cent, etc., was calculated. These data are not included in this report, but essentially they demonstrated the following points. If, for example, the median 50 per cent of pitches used is considered, the value for the range is only 1.07 tones at the ten-year-old level, 1.58 tones at 14, and 2.42 tones at 18, or, in other words, that the median 50 per cent of pitches used by the eighteen-year-old subjects was distributed over more than twice as wide a range as those of the ten-year-old subjects.

The median 50 per cent of pitches used is similar to Q, the Semi-Interquartile Range, the statistical measure of variability which is half of the difference between the 75th and 25th percentile scores. The values for Q are 0.54, 0.79 and 1.21 tones, respectively, for the ten-, fourteen- and eighteen-year-old groups. It was further shown that with the exception of the median 10, 20, and 100 per cent ranges, the range in tones which subtended any given percentage increased progressively with age. From this consideration it is seen that the measures of the total pitch range,[17] that is, that range which included 100 per cent of the pitches used, is not descriptive of the

[17] The total pitch range is the distance between the highest and lowest pitches used, computed by means of the formula $N = 19.93 \log \frac{f_1}{f_0}$ for tones and $N = 39.86 \log \frac{f_1}{f_0}$ for semi-tones, where f_1 is the higher and f_0 the lower frequency.

"functional" pitch range. The ten-year-old subjects have total average pitch ranges of 9.89 tones, nevertheless a range of only 3.16 tones contains 90 per cent of the pitches used. The ranges for the median 90 per cent of the cases for the fourteen- and eighteen-year-old groups are, respectively, 5.35 and 6.18 tones. It is probable that the ranges for the median 90 per cent of the cases give a more accurate relative expression of the differences in this respect for the various age levels.

The measures of the mean total pitch range for the groups exceeded those reported in most previous studies. *Lewis and Tiffin,*[18] for example, found ranges between 3.8 and 9.9 tones. According to *Murray and Tiffin,*[19] the pitch ranges of poor, good, and trained voices are 2.9, 4.5, and 6.3 tones, respectively. For factual reading, *Lynch* [20] reports total pitch ranges of 5.8 tones for untrained and 8.2 tones for trained readers. The wider ranges found in the study of *Pronovost*[21] and in the present study may be attributed, at least, in part, to the use of a considerably larger sample, having a length of 55 words, or 76 syllables.

The mean rate at which pitch changes [22] is shown by Table I. A further confirmation of the monotony of the ten-year-old voices is shown by the fact that the two older groups show nearly twice as rapid a rate of pitch movement as do the subjects of the youngest group. The low value for the ten-year-old group, 7.7 tones per second, is probably due to a smaller extent of shifts and inflections and to a much slower rate of reading. It is to be remembered that these measurements are taken from reading performances, and that they may not necessarily be typical of ten-year-old *speech.* In all the subject groups except the eighteen-year-old group, the tendency was for pitch to move upward at a slightly more rapid rate than downward.

The fourteen-year-old and eighteen-year-old groups tend to have

[18] *op. cit.*

[19] Murray, E. and Tiffin, J. "An Analysis of Some Basic Aspects of Effective Speech," *Ar. Sp.*, 1, (1934), 41–83.

[20] Lynch, G. E. "A Phonophotographic Study of Trained and Untrained Voices Reading Factual and Emotional Material," *Ar. Sp.*, 1, (1934), 9–25.

[21] *op cit.*

[22] This measure was proposed by Fairbanks, G. and Pronovost, W. "An Experimental Study of the Pitch Characteristics of the Voice During the Expression of Emotion," *Sp. Monog.*, 6, (1939), 87–104.

a slightly greater number of changes in direction of pitch movement [23] during phonation. Furthermore, the number of changes during phonation, which are one semi-tone or greater, exceed the number of changes less than one semi-tone in extent at the eighteen-year level, while the opposite is true at ages ten and fourteen. When inflections and shifts are considered together, changes which are greater than one semi-tone are more frequent than those which are less than one semi-tone. This is true at all the age levels considered.

2. *Analysis of Voice "Breaks."*

Twenty measurable voice "breaks" occurred in the reading performances of the ten-year-old subjects, 25 at the fourteen-year-old level, and none among the eighteen-year-old subjects.[24] The most remarkable feature of the voice breaks measured was that they invariably showed an abrupt change in the length of the period [25] from one wave to the next. In this respect they are essentially different from the inflectional type of frequency modulation in which the period changes gradually. Figure II presents graphical representations of the typical form of voice breaks. The breaks presented in this figure are from an abnormal case of voice change which will be discussed below, and are, for the most part, higher on the frequency scale than those at the ten- and fourteen-year levels. However, they will serve to show the typical form of the break. The curves were plotted from measurements of the periods of individual sound waves. The abscissa is wave number and, hence, does not represent time exactly. Ten waves immediately before and immediately following each break were considered whenever possible, since inspection of a large number of oscillograms indicated that such a procedure gave an adequate measure of the pitches from which and to which the breaks occurred. In the top line of the graph are plotted the typical upward breaks, the extent of which can be observed to be in the neighborhood of one octave. At the left in the bottom row are shown breaks in which,

[23] Each point during phonation or shift where the pitch movement changed from upward to downward, or vice versa, was designated as a pitch change. The total number divided by the total duration of the selection gives an expression of the mean number of changes in direction of pitch per second.

[24] At the ten-year-old level, two breaks presented such a chaotic state that they could not be measured with any degree of certainty; seven such occurred at the fourteen-year-old level. Only breaks measured with certainty are reported in these results.

[25] Duration of one cycle, *i.e.*, the reciprocal of the frequency.

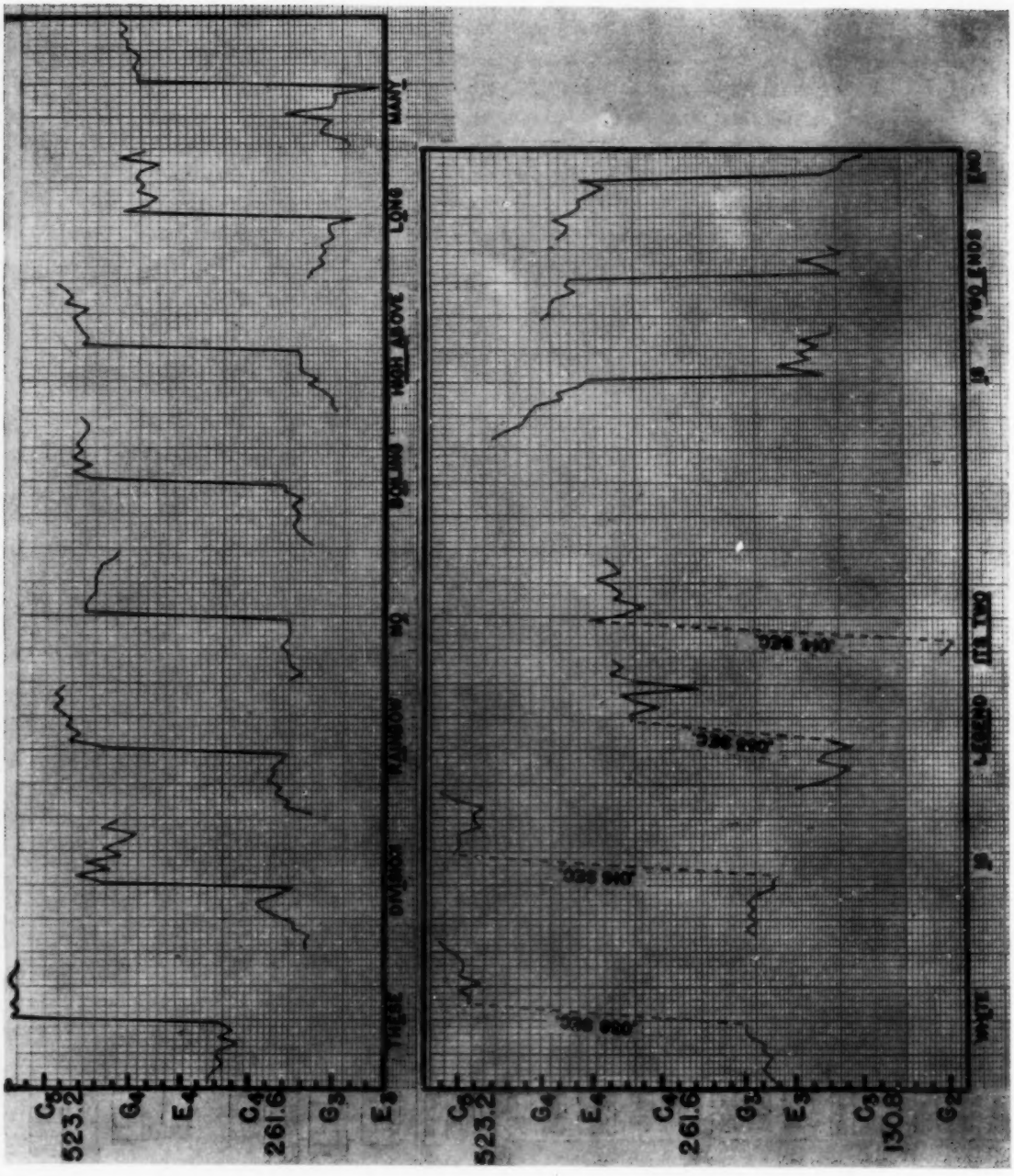

FIGURE II

Graphical representations of breaks in the voice of Subject Z, from measurements of the periods of individual sound waves. Tones of the musical scale are plotted along the ordinate; the abscissa is wave number.

between the low and high frequencies reached by the voice, are chaotic periods during which frequency cannot be measured with certainty. Those periods are represented by dotted lines and the respective durations indicated. At the right are shown three examples of downward breaks.

Investigation of the frequency distribution of pitches from which voice breaks occurred indicated that the majority, both of upward and downward breaks, occurred within a relatively narrow frequency range. Considering the upward breaks of the ten-year-old subjects, for example, all eleven occurred within a three tone range.

The breaks, both upward and downward, of the ten-year-old group were located higher on the frequency scale than those of the fourteen-year-old subjects. The mean pitch of tones from which upward breaks were made was 1.6 tones higher for these breaks for the ten-year-old group, and the pitch of tones from which downward breaks were made was 0.5 tone higher for downward breaks at the ten-year-old level.

All of the upward breaks occurred from points lower than the pitches at which downward breaks occurred. The mean and median frequencies from which upward breaks occurred lie about three octaves above the zero frequency level, or approximately at middle C. Upward breaks occurred at a level approximately one octave below the respective median pitch levels; downward breaks occurred at a pitch level very close to the median pitch levels.

A frequency distribution of the extents of breaks indicated that the mean and likewise the mode, extent of breaks, both upward and downward and for both ten- and fourteen-year-old groups, were very close to six tones, *i.e.*, one octave. This was not invariably the case, however, since, particularly in the upward breaks, a few isolated cases deviated from this value. The downward cases were especially compact, but tended to be of slightly less extent than the upward breaks, the mean downward extent was 5.88 tones as compared to a mean of 6.42 tones for upward breaks. The mean extent of breaks tended to be slightly greater, both upward and downward, for the fourteen- than for the ten-year-old subjects.

In summary, two points have been noted with regard to voice breaks which seem of importance: First, in both the ten- and fourteen-year-old subjects, the breaks occurred below the median pitch, *i.e.*, the typical location of the breaks was between the median pitch and a point one octave below; second, the average and also the mode extent of breaks is approximately one octave. An interpretation of

these findings is entirely a matter of speculation at the present time. When the abruptness of the breaks is considered it seems unlikely that they are of the nature of the ordinary neuromuscular changes which produce normal variations in intonation. The fact that the breaks seem typically to be one octave in extent suggests that the phenomenon may be analogous to that found in an overblown pipe, in which an increase in air pressure produces an octave change in the pitch. This view would indicate that fruitful study might be made of changes in breath pressure in adolescent speech. However, such an investigation is beyond the scope of the present study.

The location of the breaks below the median pitch level may be explained with more certainty. During ages when breaks are occurring, it is conceived that the laryngeal anatomy of the normal male is undergoing reorganization which will result in the establishment of a new vocal pitch level at the common level of adult male speech. This is indicated by the difference in median pitch level between ten and eighteen years of age. The breaks found at ten and fourteen years are down to and up from the region of this adult pitch which probably is to be established in a few years for these subjects, and which adjustment may be assumed to be in progress at age fourteen. In this connection, it has been somewhat surprising to find a large number of breaks occurring at ten years. From this it would appear that a genetic study which would follow the same subjects from early childhood probably would be highly revealing.

3. *Analysis of Two Special Cases Undergoing Voice Change.*

In addition to the groups of subjects, two additional marked cases of voice change were studied. The first subject, Y, was a member of the freshman class at the State University of Iowa, 1938–39, age 19 years, and was brought to the attention of this study because of the lengthy persistence of his period of voice change. Subject Z was a student at the University High School, age 15 years; the breaks in his voice were much more frequent than in the average male undergoing change of voice. Figure III presents graphical representations of the frequency distributions of pitches used by these two subjects.

It will be noted that each of the distributions in Figure III is bi-modal, the secondary peak indicating the location of the pitches to which upward breaks were made. These distributions suggest also one marked difference between the breaks of the ten- and fourteen-year-old groups and those of the two special cases. The breaks of the nineteen-year-old subject occurred at the same frequency as those of the ten- and fourteen-year-old subjects. In the case of the nine-

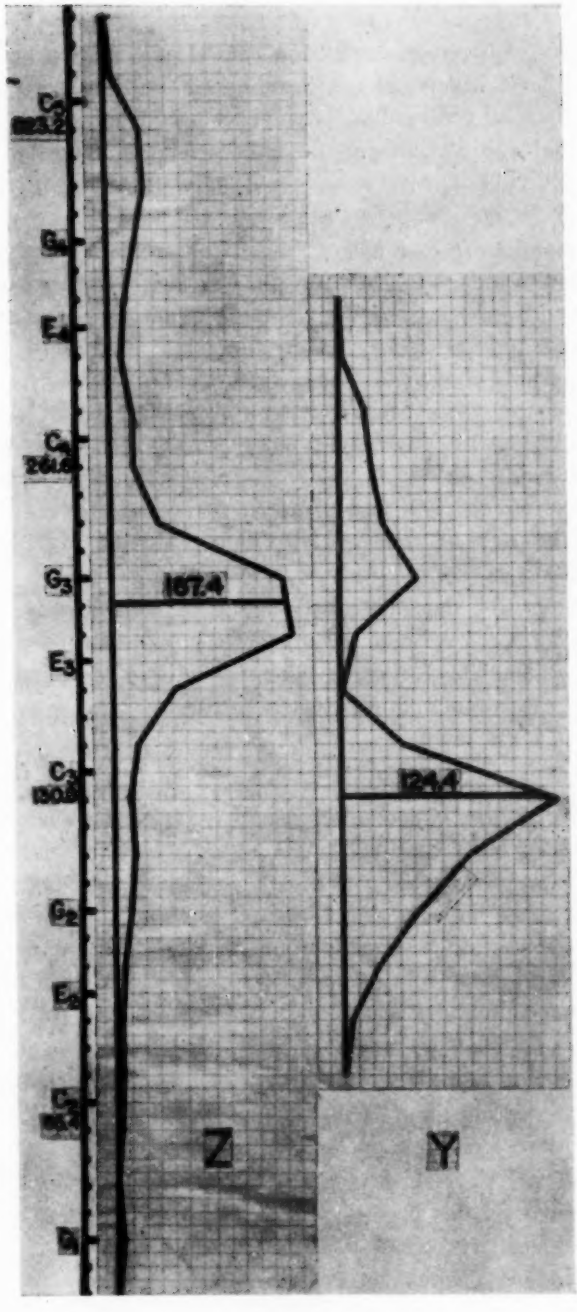

FIGURE III

Frequency distributions of pitches used for each of the two special cases studied, subjects Y and Z. Tones of the musical scale are plotted along the ordinate; the abscissa, for each individual, is the percentage of the total measured pitches.

teen-year-old subject, however, the breaks are seen to be *above* the adult pitch level which had been established for him (see Figure III), breaking back to the median pitch level used by the ten- and fourteen-year-old subjects, while the breaks of the ten- and fourteen-year-old individuals, although occurring over the same range, are *below* their median pitch levels.

The situation for subject Z, the fifteen-year-old special case, is somewhat different than that for Y. For Z, the *upward* breaks occurred from approximately the same level as the *downward* breaks for the ten- and fourteen-year-old subjects. This point, 224 c.p.s., was considerably above Z's median pitch level of 187.4 c.p.s. It would appear that the voice of this fifteen-year-old subject has lowered somewhat in general pitch level, but that his voice tends to "break" when he extends his inflections above this level into the region of the voice breaks for the ten- and fourteen-year-old subjects. Z's breaks, however, like those of Y, are *above* this point, rather than below as in the case of the two younger groups.

Frequency distributions of the extents of the breaks of special cases Y and Z were very similar, except for two eight-tone downward breaks of subject Z, to those of the ten- and fourteen-year-old subjects. The same general range was indicated.

III. Summary

Samples of pre-adolescent, adolescent, and post-adolescent male voices were secured by recording phonographically the oral reading of a 55-word test passage by six subjects at each of three age levels, 10, 14 and 18 years, respectively. Measurement of the pitch characteristics of the voices studied was accomplished by means of a standard technique for fundamental sound-wave frequency measurement. The results may be summarized as follows:

1. The greatest separation in pitch level between any two successive age groups was the difference of approximately one octave between the median pitch levels of the fourteen- and eighteen-year-old subjects.

2. The pitch levels of the ten- and fourteen-year-old subjects coincided closely near C_4, 261.6 c.p.s., while those of the eighteen-year-old subjects were close to C_3, 130.8 c.p.s.

3. Generally speaking, pitch variability increased progressively with age among the subjects studied. Arbitrarily considering the median 90 per cent of the range as a good indication of the "func-

tional" pitch range, the monotony of the younger age groups is demonstrated.

4. The monotony of the ten-year-old voices is shown by the fact that the two older groups used nearly twice as rapid a rate of pitch movement as did the subjects of the youngest group. This slow rate probably is due to a smaller extent of shifts and inflections and to a much slower rate of reading. In all the subject groups except the eighteen-year-old group, the tendency was for pitch to move upward at a slightly more rapid rate than downward.

5. The number of changes during phonation only which are one semi-tone or greater, exceeded the number of changes less than one semi-tone in extent at the eighteen-year-old level, while the opposite was true at ages 10 and 14. When inflections and shifts are considered together, the mean number of changes which are greater than one semi-tone were more frequent than those which are less than one semi-tone.

Wave-to-wave measurements of the examples of voice "breaks" found in the records revealed the following facts:

1. The measurable breaks showed an abrupt change in the length of the period from one wave to the next. In this respect they are essentially different from the inflectional type of frequency modulation in which the period changes gradually.

2. The majority, both of upward and downward breaks, occurred from frequencies within a relatively narrow range. For the upward breaks of the ten-year-old subjects this range was three tones.

3. The mean and median frequencies from which upward breaks occurred were found to lie about three octaves above the zero frequency level, 16.35 c.p.s., while the same measure located the pitch of downward breaks at about four octaves above the zero frequency level.

4. Upward breaks occurred at a level approximately one octave below the respective median pitch levels, while downward breaks occurred at a pitch level very close to the median pitch levels. Both types of breaks are seen, thus, to lie typically below the median pitch level.

5. The mean, and likewise the mode, extents of breaks, both upward and downward, and for both ten- and fourteen-year-old groups, were found to approximate six tones, *i.e.*, one octave.

Two special cases of voice change were studied, and these presented some different aspects of voice change.

1. The breaks were located *above* the median pitch levels rather

than *below* them, as in the speech of the ten- and fourteen-year-old subjects.

2. The fifteen-year-old special case presented upward breaks from frequencies considerably above his median pitch level.

3. As at the ten- and fourteen-year-old levels, the typical extent of the breaks was found to be one octave.

INTRAMUSCULAR PRESSURE IN STUTTERERS AND NON-STUTTERERS*

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INTRODUCTION

I. *Purpose of Study*

Many speech correctionists accept the theory that stutterers are always in a state of "nervous tension."

In their discussion of psychogenic speech disorders West, Kennedy and Carr state that:

"Practically all types of psychogenic disorders that disturb speech are characterized by hypertonic muscles; it is probably through the hypertonicity that the neurosis operates to disturb speech. Neuroses not characterized by over-tense muscles seldom show speech disorders." [1]

They say further that:

"The commonest of all disturbances of speech in the twilight zone of psychogenic disorders discussed in the previous chapter [from which the above quotation was taken] is a type of dysphemia that manifests itself in stuttering." [2]

West, Kennedy, and Carr thus suggest a possible relationship between hypertonicity caused by neuroses and stuttering.

Seth and Guthrie in discussing stuttering have the following to say:

"One of the most prominent and fundamental symptoms in all cases of developed stuttering is that of muscular rigidity." [3]

Boome and Richardson have stated that:

"Rigidity and spasmodic movements are, unfortunately, not confined to the actual mechanism of speech, nor are they only in evidence during the process of articulation." [4]

* This study is a part of the program of research of the University of Minnesota Speech Clinic, under the direction of Professor Bryng Bryngelson. The complete original data are on file at the Clinic. The problem was suggested by Dr. G. Clinton Knowlton of the University of Iowa.

[1] West, R., Kennedy, L., and Carr, A., *The Rehabilitation of Speech,* Harper, New York, (1937), 47.

[2] West, Kennedy, and Carr, *op. cit.,* 53.

[3] Seth, G., and Guthrie, D., *Speech in Childhood,* Oxford University Press, London, (1935), 194.

[4] Boome, E. J., and Richardson, M. A., *Nature and Treatment of Stammering,* Dutton, New York, (1932), 42.

Thus Boome and Richardson imply that stutterers evidence hypertonicity even in non-speech activities.

The purpose of this study is to obtain data relevant to the viewpoints cited above, *i.e.*, to determine, within the limitations of the method used, whether differences in intramuscular pressure exist between stutterers and non-stutterers in non-speech activities.

II. *History and Theoretical Considerations of Method*

Research in recent years has indicated that muscle tonus influences many of the bodily functions. Henderson[5] has called attention to the influence of hypotonia in post-operative atelectasis and circulatory failure. He has recently advanced the thesis that maintenance of the blood circulation is dependent not only upon the action of the heart but also upon the pressure induced in the bodily musculature by the tonus of the muscles.[6] He has found this tonic intramuscular pressure to be a prime factor in the venous return of the blood to the heart.

Henderson[7] reports an experiment on a sympathectomized animal, originally performed by Riml, which showed that there is sufficient tonic elasticity present in the tissues to exert a pressure equal to a column of blood 10 or 12 centimeters in height, which pressure was instrumental in forcing "a considerable part of the blood in the body out through the veins."

Much research has been directed toward devising a method of measuring objectively this intramuscular pressure. Many original methods have been described in the literature, which are adequately summed up by Kerr and Scott[8] in the following paragraph:

> "The elastometers of Wertheim Salomonson, Noyons, Mangold, and Gildemeister are ingenious pieces of scientific apparatus, but are open to so much criticism that they have never come into general use. Gildemeister's method of measuring tonus by means of a hammer and ballistic galvanometer has been used clinically by Springer, Hosiosky, and others, but the readings obtained in this way may vary considerably with the amount of subcutaneous fat present

[5] Henderson, Y., "Depression of Muscle Tonus as a Cause of Atelectasis, Failure of the Circulation, and Other Post-operative Sequelae," *Lancet*, 229, (1935), 178–181.

[6] Henderson, Y., Oughterson, A. W., Greenberg, L. A., and Searle, C. P., "Muscle Tonus, Intramuscular Pressure and The Venopressor Mechanism," *Amer. J. Physiol.*, 114, (1936), 261–268.

[7] Henderson, Y., Oughterson, A. W., Greenberg, L. A., and Searle, C. P., *loc. cit.*

[8] Kerr, J. D. O., and Scott, L. D. W., "The Measurement of Muscle Tonus," *Brit. Med. J.*, 2, (1936), 758–760.

in the part under consideration. The use of such apparatus shows the resistance of the tissues to a deforming force, and cannot be claimed to give an accurate estimate of muscle tonus. The elaborate apparatus of Fenn and Garvey is of value for research rather than for clinical purposes. In fact the only practical method available . . . has been until recently the estimation of the degree of passive movement obtainable at the joints. By this means gross hypotonia could be appreciated, but could not be recorded graphically."

A simple and practical method of measuring intramuscular pressure has recently been described by Henderson, Oughterson, Greenberg, and Searle.[9] This method is based upon the fact that even when a muscle is at rest the bundles of fibers are in a certain tonic state, causing a transverse pressure to be exerted between the muscle fibers. This intramuscular pressure might be measured by determining the pressure required to spread the muscle fibers apart sufficiently to permit the injection of a minute amount of saline solution into the body of the muscle through a hypodermic needle. Thus, according to Henderson, a quantitative estimate of the tension of the muscle fibers may be indirectly obtained.

Henderson *et al.*, in further clinical studies of intramuscular pressure (or tension),[10] have obtained consistent results, verifying the reliability of this method. In subsequent studies by Kerr and Scott[11] Beigelbock and Junk,[12] and Hellebrandt *et al.*,[13] further confirmation of its reliability has been obtained.

Henderson's method of measuring intramuscular pressure has thus made possible an objective investigation of the problem set forth in the first section of this Introduction.

Subjects, Apparatus, and Procedure

I. *Subjects*

The experimental group was composed of 24 male stutterers, 12 from the University of Minnesota Speech Clinic and a similar num-

[9] Henderson, Y., Oughterson, A. W., Greenberg, L. A., and Searle, C. P., *loc. cit.*

[10] Henderson, Y., Oughterson, A. W., Greenberg, L. A., and Searle, C. P., "Air Movement as a Stimulus to the Skin, The Reflex Effects Upon Muscle Tonus, and Indirectly Upon the Circulation of the Blood; also the Effects of Therapeutic Baths," *Amer. J. Physiol.*, 114, p. (1936), 269–272.

[11] *Op. cit.*

[12] Beigelbock, W., and Junk, H., "Der Muskeltonus und seine Beziebungen zum peripheren Kreislauf," *Ztschr. f. Klin. Med.*, 131, (1937), 241–257.

[13] Hellebrandt, F. A., Crigler, E. F., and Kelso, L. E. A., "Variations in Intramuscular Pressure During Postural and Phasic Contraction of Human Muscle," *Amer. J. Physiol.*, 126, p. (1939), 247–253.

ber from the Speech Clinic of the State University of Iowa. The ages ranged from 18 years 0 months to 31 years 2 months, the mean age being 22 years 7 months.

Each stutterer was matched with a control in regard to age and sex. The age differences between the stutterers and their respective controls were not greater than 6.0 months, except for two pairs, where the differences were 8.3 and 9.4 months respectively. The mean age difference between each stutterer and his control was 3.2 months. A number of female subjects was also studied.

None of the controls had ever stuttered, and there was no stuttering in the immediate family history of any of them.

II. *Apparatus*

The apparatus used in this study is an adaptation of Kerr and Scott's[14] modification of the Henderson apparatus.

Specially prepared number 20 hypodermic needles were used for insertion into the muscle. The opening at the end of the needle was closed with solder and three holes were drilled in the shank of the needle near its point. A glass capillary tube was fitted into the butt end of the needle by means of a glass adapter which had been fused to one end of the tube. The capillary had a 1.8 millimeter bore and was 16 centimeters in length. Pressure was measured with a U-tube water manometer, which was connected to the free end of the capillary by a length of pressure tubing. The manometer was graduated in millimeters. Any desired pressure could be obtained by raising or lowering a water reservoir attached to the manometer stand.

III. *Procedure*

The subject sat in a comfortable upholstered chair with his eyes closed and his head lying back upon the padded upper section of the backrest. His right arm and hand rested upon the wide, flat, wooden armrest of the chair, the elbow being flexed at an angle of approximately 135 degrees to ensure relaxation.[15] All of the measurements were made on the biceps muscle of the right arm as thus relaxed.

The skin over the biceps was sterilized with alcohol and rendered anesthetic with novocaine. The needle and capillary tube to be used were sterilized by boiling. The end of the capillary tube to which the glass adapter had been fused was fitted into the butt end of the

[14] *Op. cit.*

[15] Henderson, Y., Oughterson, A. W., Greenberg, L. A., and Searle, C. P., *loc. primo cit.*

needle and sterile physiologic saline was drawn by suction through the needle and into the capillary to about one-half its length. The free end of the capillary tube was then connected to the manometer by means of a length of pressure tubing, after which the needle was inserted into the body of the muscle through the anesthetized area of the skin. Care was taken to keep the capillary in a horizontal position so as to eliminate the effects of gravitational force upon the flow of the saline.

One experimenter gradually raised the pressure in the manometer while a second experimenter watched the meniscus in the capillary until it had moved one millimeter. He then signaled to the first experimenter who read the pressure on the manometer. This arbitrary end-point of a one-millimeter movement was chosen in order to standardize the technique. Values thus obtained are higher than they would have been if the first movement of the meniscus had been taken as the end-point, but this latter method is subject to too many fluctuations and inaccuracies of judgment. Movements of the meniscus were observed with the aid of a magnifying glass against a background furnished by a strip of graph paper with millimeter divisions.

Measurements of intramuscular pressure were made for each subject on three different days. Four pressure readings were obtained each day, during a single sitting. In all cases the first reading was discarded and an average was taken of the next three. The first reading was used as a check on whether or not the openings in the needle had become plugged with tissue when thrust into the muscle. A spuriously high pressure reading would be obtained if the free flow of the saline into the muscle were obstructed by tissue.

DATA[16]

A correction of 13.0 millimeters was applied to each intramuscular pressure reading to allow for friction in the needle-capillary system. This correction was determined by measuring the amount of pressure needed to cause a one-millimeter movement of the meniscus in the capillary while the needle was submerged in a horizontal position under a known head of water. This correction is undoubtedly somewhat inexact, but it is obviously impossible to reproduce

[16] The data were analyzed statistically according to Fisher's formulae, as found in Lindquist, E. F., *Statistical Analysis in Educational Research,* Houghton Mifflin, New York, (1940).

experimentally the conditions which obtain in the muscle. It was felt that the method described gave a more valid correction than any other method that could have been used.

In general, although the readings for each subject during any one experimental sitting were consistent, there was considerable variability from individual to individual, and in the same individual on different sittings.

The data were subjected to an analysis of variance in order to determine whether the pressure readings obtained during each of the three sittings could be combined for the statistical analysis, or whether it was necessary to deal with each day's readings separately. This analysis showed that the individual and group variances for each experimental sitting taken separately were not significantly greater than the variances from sitting to sitting or for all three experimental sittings combined. Thus it was permissible to combine the data obtained during all three sittings in the statistical analysis.

The pertinent data on the stutterers and controls are shown in Table I. The means for the individual subjects were determined by computing the average of the nine intramuscular pressure readings obtained during their three sittings.

TABLE I [17]

STATISTICAL DATA ON INTRAMUSCULAR PRESSURE OF 24 MALE STUTTERERS AND 24 MALE CONTROLS
VALUES IN MILLIMETERS OF WATER PRESSURE

MEASURE	STUTTERERS		CONTROLS
Mean	98.73		109.72
Difference between means		10.99	
S.E. diff.		7.39	
t		1.49	
p		14%	
S.D.	23.34		26.77
Difference between S.D.'s		3.43	
F		1.4	
p		>5%	
Median	101.76		115.20
Range	61.7–143.7		54.5–145.8

The above table shows that, in general, the controls averaged higher intramuscular pressure readings than the stutterers and were

[17] The significance of the difference between the means was determined by Fisher's *t*-test. The Variance-Ratio, or Snedecor's *F*, was used to determine the significance of the difference between the two S.D.'s. *p* represents the percent of chances that a difference as great as or greater than the obtained difference would occur by chance between two random samples from the same homogeneous population.

also more variable, but that these differences are not statistically significant. The mean intramuscular pressure for the stutterers was 98.73 millimeters and for the controls 109.72 millimeters, the standard deviations being 23.34 and 26.77 respectively. There are 14 chances in 100 that a difference between the means equal to or greater than the obtained difference would occur by chance, and there is a probability greater than 5 chances in 100 that the obtained difference between the S.D.'s would occur by chance.[18]

The mean intramuscular pressure of the stutterers and controls combined—48 subjects in all—was 104.23 millimeters, the standard deviation being 25.70.

In addition to the main group, 8 female subjects were run, of whch two were stutterers. Of the six non-stutterers, two served as controls for the stutterers. The ages of the female stutterers were 22 years 9 months and 20 years 6 months; they differed from their controls by 5.4 and 0.8 months respectively. The mean intramuscular pressure readings of the female stutterers were 58.3 millimeters and 98.4 millimeters, while the pressure readings of their corresponding controls were 99.3 millimeters and 41.4 millimeters. The mean for the eight female subjects combined was 76.19 millimeters and the standard deviation 20.68. The complete data on these subjects are presented in Table II.

TABLE II

STATISTICAL DATA ON INTRAMUSCULAR PRESSURE OF 8 FEMALE SUBJECTS
VALUES IN MILLIMETERS OF WATER PRESSURE

MEASURE	VALUE
Mean	76.19
S.D.	20.68
Median	79.95
Range	41.4–99.3

Correlations of intramuscular pressure with age, systolic blood pressure, and diastolic blood pressure were computed; also a multiple correlation with both systolic and diastolic blood pressure. In computing the correlation of intramuscular pressure with age the mean intramuscular pressure for the three sittings was used. The entire group of male and female subjects—56 in all—was included in this correlation. Blood pressure determinations were not made on every subject, or at all three sittings for every subject. All told, a total of 72 blood pressure readings was taken on 39 subjects. The blood

[18] This was determined by reference to Tables of t and Tables of F respectively.

pressure determinations were made at the end of the day's sitting; thus these data were correlated with the mean intramuscular pressure obtained during that particular sitting, rather than with the gross mean for all three sittings. The various correlations obtained are shown in Table III.

TABLE III[19]

CORRELATION OF INTRAMUSCULAR PRESSURE WITH AGE AND BLOOD PRESSURE

CORRELATION OF INTRAMUSCULAR PRESSURE WITH	*r*	*t*	*p*
Age	−.18	1.32	11%
Systolic Blood Pressure	−.14	.82	49%
Diastolic Blood Pressure	−.002	.015	91%
Multiple *r* with S.B.P. and D.B.P.	.14	.71	42%

Table III shows that there were no significant correlations of intramuscular pressure with age or with any measure of blood pressure.

DISCUSSION

The variability in tonic intramuscular pressure found in this study is in agreement with the findings of Smith, Martin, Garvey and Fenn,[20] who concluded that:

"As might be expected, there is considerable variation in the muscle tone of different individuals and in the same individual at different times."

Henderson and his co-workers[21] obtained intramuscular pressure readings of between 60 and 90 millimeters of water on healthy young men. Substantially equivalent results were obtained by Kerr and Scott[22] and Beigelbock and Junk.[23] Hellebrandt *et al.*[24] reported readings that were somewhat higher, but not markedly so. In all of these studies the pressure readings were taken the moment the meniscus in the capillary was believed to have moved. The higher pres-

[19] The significance of the *r*'s was determined by Fisher's *t*-tests. *p* represents the percentage of chances that a correlation as large as or larger than the one obtained would occur by chance if a random sample of this size were taken from a population in which the correlation of these variables was zero.

[20] Smith, A. E., Martin, D. S., Garvey, P. H., and Fenn, W. O., "A Dynamic Method for Measurement of Muscle Tonus in Man," *J. Clin. Investig.*, 8, (1930), 597–622.

[21] Henderson, Y., Oughterson, A. W., Greenberg, L. A., and Searle, C. P., *loc. primo cit.*

[22] *Op. cit.*

[23] *Op. cit.*

[24] *Op. cit.*

sures obtained in the present study—averaging 104.23 millimeters for the main group of male subjects—may be largely accounted for by the fact that the readings were taken at the end of a one-millimeter movement of the meniscus, during which interval the increasing of the pressure in the manometer was continued.

A comparison of the means for the male and female subjects indicates that a sex difference in intramuscular pressure may exist. The mean for the female subjects was 76.19 millimeters as compared to 104.23 millimeters for the males. Definite conclusions cannot be drawn, however, on the basis of so few female subjects.

Many speech correctionists who are of the opinion that stutterers are constantly in a state of greater bodily tension than non-stutterers believe that the successful treatment of this disorder should—in part, at least—be based upon relaxation exercises.

West, Kennedy and Carr,[25] for instance, have stated that:

"Inasmuch as the stutterer resembles the spastic in certain of his symptoms, some of the therapeutic techniques that are used with spastics may be used with the stutterer. Relaxation and gymnastic exercises are particularly indicated."

Seth and Guthrie[26] have said:

"Before we can hope for any amelioration of the disturbance of speech [stuttering], the patient must be released from his self-imposed strait-jacket ["muscular rigidity"]. It is to this end that Boome and Richardson recommend that some ten minutes near the beginning of each class period be wholly given up to relaxation-treatment."

Referring directly to Boome and Richardson[27] we read that: "The basis of all treatment for stammerers—whether individually or in a group—should be relaxation." Gifford[28] has written of relaxation as: "The direct road to free speech."

Bender and Kleinfeld,[29] Greene,[30] and Scripture[31] have also advocated relaxation exercises in stuttering therapy, as have many others.

[25] *Op. cit.*, 63.

[26] *Op. cit.*, 194.

[27] *Op. cit.*, 101.

[28] Gifford, M. F., *Free Speech, The Stutterer's Right*, Thomson, San Francisco, (1937).

[29] Bender, J. F., and Kleinfeld, V. M., *Speech Correction Manual*, Farrar and Rinehart, New York, (1936).

[30] Greene, J., in *"A Symposium on Stuttering,"* (Ed. West, R.), College Typing Co., Madison, (1931).

[31] Scripture, E. W., *Stuttering, Lisping, and Correction of the Speech of the Deaf*, Macmillan, New York, (1923).

The results of this study would seem to have certain implications as to the value of relaxation exercises in the treatment of stuttering. No significant differences in muscular tension were found to exist between the stutterers and controls, as indicated by their intramuscular pressure. The data show that if any difference does exist it lies in the direction of greater tonic intramuscular pressure for the non-stuttering controls. Thus, if stutterers are considered to be suffering from too much bodily tension and in need of relaxation exercises as part of their treatment, the need for relaxation may be even greater for non-stutterers.

Heightened muscular tension is not necessarily an accompaniment of stuttering. As Blanton and Blanton[32] have written:

> "Three or four of the worst stutterers we have ever seen were extremely relaxed in the ordinary sense of the word, and not only extremely relaxed, but also extremely rhythmic and possessed of very fine muscular control, one being an expert flyer. Yet with the relaxation, with the rhythm, and with the mechanical skill and a very high grade of coordination, the stutter persisted. The fundamental, underlying [psychological] conflict had not hit these faculties but had hit the speech."

The obvious tensions and strains connected with the spasms of many stutterers are undoubtedly the basis on which theorists have postulated a generalized increase of muscle tension in the stutterer. These tensions and strains appear to be learned reactions to the experience of stuttering, according to Van Riper.[33] In view of the present data it would seem that such tensions are confined to spasm reactions—at least the stutterers in this study did not evidence greater muscle tension in the non-speaking situation in which the intramuscular pressure was recorded.

It is not the purpose of the present writers to deny the value of relaxation therapy for stutterers, but the results of this study indicate that it is not the muscular relaxation *per se* which benefits the stutterer. Perhaps the benefits are to be explained in terms of possible psychological correlates of the relaxation therapies used—the inculcation in the stutterer of such mental states as are indicated vaguely by the terms "calmness," "poise," "self-confidence," "freedom from strain," "tranquility," "feeling of stillness," etc.

[32] Blanton, S., and Blanton, M. G., *For Stutterers,* Appleton-Century, New York, (1936), 116.

[33] Van Riper, C., "The Growth of the Stuttering Spasm," *Quart. J. Speech,* 23, (1937), 70–73.

To quote again from Blanton and Blanton:[34]

"Relaxation is an excellent adjunct to treatment. It has value only when used as an adjunct."

"It is very obvious that as soon as the stutterer's psychological tension returns, his physiological relaxation will leave. Therefore, relaxation in itself is useless unless it is accompanied by a definite effort to get the necessary insight into difficulties in order that the profound physiological relaxation may be maintained. Excess tension is unquestionably the enemy of clear thinking and good speech, and whatever relieves excess tension is of value to the individual, but the physical approach alone is inadequate. Real relaxation is bound to come from the inside."

The evidence from the present study tends to support this viewpoint of the Blantons. It has been shown that no significant differences in intramuscular pressure—and by inference, in muscular tension—exist between the stuttering and non-stuttering subjects. Since the degree of muscle tension did not differentiate the stutterers from their non-stuttering controls, it appears that beneficial results accruing from relaxation treatment may be ascribed to the psychological effects of such relaxation, rather than to the direct physiological relaxation itself. Thus it would appear that whatever beneficial results may come from relaxation might be attained more directly by working on the psychological or neurological aspects of the disorder.

Summary and Conclusions

The intramuscular pressure of 24 male stutterers and 24 male controls was measured. Measurements were also made on 8 female subjects. Correlations of intramuscular pressure with age and with various measures of blood pressure were run.

The following conclusions may be drawn from the data:

1. Stutterers do not differ reliably from non-stutterers in intramuscular pressure. Although the stutterers evidenced lower intramuscular pressure and were less variable, these differences were not statistically significant.

2. The data seem to indicate that females have a lower intramuscular pressure than males, but because of the small number of female subjects used no decisive conclusions are warranted.

3. The present study does not show a reliable correlation of intramuscular pressure with age within the age range of the subjects used.

[34] *Op. cit.*, 115, 116.

4. No significant correlation was found between intramuscular pressure and systolic blood pressure or diastolic blood pressure, or with both taken together.

5. This study would indicate that stutterers are not more tense than non-stutterers and the theories and therapies of stuttering based upon this assumption are in need of revision.

A COMPARATIVE STUDY OF THE BLOOD CHEMISTRY OF STUTTERERS AND NON-STUTTERERS

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THE bio-chemical approach to stuttering was suggested by the fact that stuttering is characterized by tonic and clonic spasms. Because of this it was thought that stuttering may be associated with latent tetany. Johnson[1] examined 15 male stutterers varying in age from 9 to 28 years. Serum calcium, potassium, inorganic phosphorus and blood sugar were determined. Johnson found all the figures within normal limits, although he states that the calcium figures tended toward the upper limits of the normal range.

Kopp[2] pointed out that Johnson made the error of using "text-book normals" as controls. To correct this error Kopp studied the blood chemistry of stutterers as well as non-stutterers. He found that although the resulting values were within the normal limits, reliable differences exist between the blood of the stutterers and that of the normal controls. He stated that stutterers have a higher total serum calcium, inorganic phosphorus, sugar; and a lower potassium, total protein, albumin and globulin. He also pointed out that there exists a difference in the manner in which these various components of the blood are correlated with each other in the stutterer. For example, the calcium and phosphorus were positively correlated in the stutterers whereas these were negatively correlated in the normal controls.

In an analysis of Kopp's work one finds several points that are open to criticism. First, Kopp's two groups, stutterers and normals, represented different age levels. For example, the ages of the normal persons on whom analysis for inorganic phosphorus was performed were between 20–39 years, while the age range of the stutterers was

[1] Johnson, W., Stearns, G., and Warweg, E. "Chemical Factors and the Stuttering Spasm," *Quar. J. of Speech*, 19, (1933), 408.

[2] Kopp, G. "Metabolic Studies of Stutterers," *Speech Monographs*, 1, (1934), 117.

between 12–32 years. Since it is known that the serum inorganic phosphorus in children is higher than in adults, to assign any significance to higher values in a lower age group other than that of normal variation is not justifiable.

Secondly, his statistical methods might be questioned for several reasons.

1. Large sample techniques were used despite the fact that the samples were rather small.

a. Instead of computing the standard deviation by dividing the sum of the squares of the deviations by N-1 and extracting the square root, "N" was used in the denominator. In other words, the standard deviation was understated to an extent measured by the square root of (N-1)/N.

b. In obtaining the sampling distribution of the "critical" ratio (the ratio of the difference between two means to the standard error of the difference) the table of the normal distribution was used instead of the table of "t." If we wish to consider the "t" table an expansion of the normal table, we may say that it was entered incorrectly at n = infinity, instead of at n = the number of degrees of freedom.

2. The computation of the standard error of the difference between two means is best done by pooling the deviations: *i.e.,* by using formula 3.4 rather than 3.5[3]. The author of the paper under discussion used formula 3.5.[4]

3. The author of the paper made the implicit assumption that the difference found between stutterers and non-stutterers could be in one direction only; namely, in the direction found in the particular experiments undertaken by him. That is, if his experiments showed the amount of calcium to be higher for stutterers, he assumed (in using Garrett's[5] table) that the amount of calcium could never be less than the amount for non-stutterers. If this assumption is admissible on good *a priori* grounds, then the efficiency of the statistical tests used is increased; if the assumption is not valid, the efficiency of the tests is reduced. In other words, if the assumption is not valid, the probabilities found by the author must be decreased by

[3] Tippet, L. H. C. *The Methods of Statistics,* 2nd ed., Williams and Norgate, London, (1937), 73.

[4] Fisher, R. A. *Statistical Methods for Research Workers,* 6th ed., Oliver and Boyd, London, (1936), 129–130.

[5] Garrett, H. E. *Statistics in Psychology and Education,* Longmans, Green and Co., New York, (1926).

the difference between unity and the probability given by him: 99 becomes 98, 94 becomes 86, etc. It is invalid to make the assumption if it is derived from the sample being tested; it must be based on entirely different grounds. (See Tippett, pp. 77–78.)

The magnitude of the difference obtained in some of the results given by Kopp, when taking points 2 and 3 into account, is given in Table I.

TABLE I

RECALCULATION OF SOME OF THE PROBABILITY VALUES OF KOPP

CONSTITUENT	CHANCES IN 100 OF TRUE DIFFERENCE GREATER THAN ZERO BETWEEN STUTTERERS AND NORMALS*	
	KOPP'S CALCULATION	RECALCULATED VALUE
Total serum calcium	99	97.2
Inorganic serum phosphorous	99	98.5
Serum potassium	95	87.0
Serum protein	99	96.3
Serum albumin	92	82.3

*This is Kopp's formulation. It would be more correct to subtract the figures in the table from 100 and head them as follows: Chances in 100 of obtaining the differences, found between stutterers and normals, purely by chance.

It is seen that on recalculation the probability values are substantially reduced. The results for serum potassium and serum albumin are, on recalculation, definitely outside the realm of statistically significant differences.

4. Even if one grants the accuracy of the difference found in Kopp's experiments, care must be taken in their interpretation. The experiments can, at most, establish that the particular group of stutterers is different from that particular group of non-stutterers; the experiments cannot establish *why* they are different, that is, the experiments do not *prove* that the differences arise because one group stutters and the other does not. The difference might, in fact, arise because the controls were not perfectly comparable in every respect (except stuttering) with the stutterers. The controls might, on the average, be older, or heavier, etc. As a matter of fact, the age distribution was distinctly higher in the normals than in the stutterers. Here the general criticism must be levied that characteristics of samples are very inefficiently presented in the form of ranges. Frequency distributions or, at least, means and standard deviations are much more useful in characterizing a sample.

On evaluating the significance of Kopp's correlational coefficients we found that although four pairs were of opposite sign, only the difference between calcium and phosphate and potassium and total

protein are significant statistically. Thus, it cannot be stated with any certainty, even on the basis of Kopp's results, that the blood pattern in stutterers is opposite to that of normals. In these calculations we assumed the maximum pairs possible, that is, we took it for granted that in Kopp's experiments, whenever a potassium was done, a calcium was also done on the same patient. For example, in the stuttering group he had 12 potassium values and 49 calcium values. The smaller number of values, which in this case happens to be potassium, limits the maximum number of pairs possible.

In view of the above considerations a study of similar nature was undertaken in our speech clinic. In these studies the normal controls were selected with special care. Each stuttering child was matched with a child of normal speech of the same age, sex, height, and weight, as closely as possible. The blood specimens were taken simultaneously on each pair of stutterers and controls. Thus, it was hoped that any differences in the blood chemistry would be due to the stuttering, per se, rather than other variations. Altogether the group consisted of twelve stutterers and twelve non-stutterers.

In the stutterers' group the subjects were healthy, normal children with no unusual characteristics, except for stuttering.

The controls were healthy, normal children with no speech impediment.

The blood was drawn in the morning on a fasting stomach. The specimen was then allowed to clot for 30 to 45 minutes, after which it was centrifuged at 1500 to 2000 revolutions per minute. The clear serum was carefully separated and used in the subsequent analysis. Hemolyzed blood samples were discarded to prevent errors due to hemolysis.

All of the chemical determinations were carried out in duplicates. The agreement between the duplicates was well within the experimental error of the methods used. The precision of the technique was also checked by means of known solutions and the recovery of known amounts of the individual constituents which were added to the blood serum.[6, 7, 8, 9, 10, 11, 12, 13, 14, 15]

[6] Van Slyke, D. D. "The Determination of Chlorides in Blood and Tissues," *J. Biol. Chem.* 58, (1923), 523.

[7] Van Slyke, D. D., and Cullen, G. E. "The Determination of Urea by the Urease Method," *J. Biol. Chem.* 24, (1916), 117.

[8] Sobel, A. E., Yuska, H., and Cohen, J. "A Convenient Method of Determining Small Amounts of Ammonia and Other Bases by the Use of Boric Acid," *J. Biol. Chem.*, 118, (1937), 443.

The statistical methods used were those described by Fisher[16] and Tippett[17]. In calculating the "P" factor two methods of statistical analysis of our data were employed. In the present study each observation of one series corresponds in some respects to a particular observation of the second series. In such a case it is customary to test the observation by both methods. It sometimes occurs that one method shows no significant difference whereas the other method shows a significant difference. If either method indicates a definite significant difference, its testimony cannot be ignored even if the other method fails to show the effect. The first method is employed when the stutterers and normals are treated as independent samples. The second method is used when the observations in the two series are paired. In both methods small sample techniques were used.

In calculating the simple correlation (partial correlation of zero order) coefficient "r," Fisher's small sample technique was followed.

Results

The results of the blood analysis of the two groups examined are given in Table II. It is seen in this table that the mean values obtained in both groups are rather close, and, in some cases, they are almost identical. The range of the values is within that of the normals found in our laboratories. The Probability Tables of the results in Table II are given in Table III using both methods described under statistical procedures. In interpreting the results, the convention of Fisher is used which considers the difference between means significant when $P < 0.05$. By this criterion none of the

[9] Howe, P. E. "The Determinations of Proteins in Blood—a Hirco Method." *J. Biol. Chem.*, 49, (1921), 109.

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[12] Sobel, A. E., and Sklersky, S. "A Direct Acidimetric Microtitration Method for Calcium," *J. Biol. Chem.*, 122, (1938), 115.

[13] Fiske, C. H., and Subbarow, Y. "The Colorimetric Determination of Phosphorus," *J. Biol. Chem.*, 66, (1925), 375.

[14] Folin, O., and Wu, H. "A System of Blood Analysis," *J. Biol. Chem.*, 38, (1919), 81.

[15] Kramer, B., and Tisdall, F. F. "A Clinical Method for the Quantitative Determination of Potassium in Small Amounts of Serum," *J. Biol. Chem.*, 46, (1921), 339.

[16] Fisher, R. A. *op. cit.*

[17] Tippet, L. H. C. *op. cit.*

TABLE II

CHEMICAL COMPOSITION OF BLOOD OF STUTTERERS AND CONTROLS

	Age Wgt.	* N S	Mg. % Cl.	Mg. % NPN	Per Cent Prot.	Per Cent Alb.	Per Cent Glob.	Alb./Glob.	Mg. % Chol.	Mg. % Ca.	Mg. % P.	Ca. x P.	Mg. % Sugar	Mg. % K
E.R. ♂	11 yrs. 105 lbs.	S		21	7.04					11.0	4.4	48	98	
C.K. ♂	11½ yrs. 102 lbs.	N		21	6.82					10.5	4.7	49	97	
F.R. ♀	13½ yrs. 92½ lbs.	S		27	6.76	3.93	2.73	1.44	197	10.2	4.0	41	70	
R.B. ♀	13½ yrs. 100 lbs.	N		25	7.24	4.18	3.16	1.32	211	10.6	4.6	49	86	
M.L. ♀	12½ yrs. 119 lbs.	S		28	6.72	3.98	2.74	1.45	175	10.1	4.2	42	71	
C.L. ♀	13 yrs. 114 lbs.	N		28	6.01	3.47	2.54	1.37	215	10.3	4.7	48	94	
A.G. ♂	8½ yrs. 84½ lbs.	S	355	24	7.05	4.11	3.94	1.05	250	10.0	4.4	44	103	16.4
I.G. ♂	9 yrs. 71 lbs.	N	357	24	7.72	4.20	3.52	1.19	206	10.0	4.4	44	97	18.5
R.D. ♂	8½ yrs. 54 lbs.	S	358	20	7.46	3.95	3.51	1.13	190	10.0	5.0	50	95	19.8
L.P. ♂	8½ yrs. 54 lbs.	N	360	29	6.84	3.75	3.09	1.21	239	10.2	5.0	51	85	20.7
S.Z. ♂	10 yrs. 83¾ lbs.	S	356	28	7.22	3.82	3.40	1.12	275	9.8	4.7	46	104	17.3
H.T. ♂	10½ yrs. 74½ lbs.	N	352	32	7.01	3.76	3.25	1.12	212	9.9	5.2	51	95	17.3

R.W. ♂	10½ yrs. 78½ lbs.	S	370	11	7.07	3.32	3.75	0.89	137	9.6	4.9	47	87	20.1
H.T. ♂	10½ yrs. 74 lbs.	N	362	28	7.6	3.8	3.80	1.00	186	10.1	4.9	50	88	22.2
N.S. ♂	3½ yrs. 40 lbs.	S	374	21	6.65	3.75	2.9	1.29	274	11.5	4.4	51	95	17.7
R.B. ♂	4 yrs. 44½ lbs.	N	366	23	7.28	3.59	3.7	0.97	178	10.5	5.3	56	92	19.3
P.G. ♂	6 yrs. 57¼ lbs.	S	373	18	6.97	4.33	2.63	1.65	224	10.0	4.5	45	91	
V.B. ♂	6 yrs. 54 lbs.	N	367	22	6.92	4.75	2.17	2.17	245	10.04	3.8	40	95	
N.M. ♂	12 yrs. 81½ lbs.	S	363	21	7.18	4.68	2.50	1.87	221	10.06	4.8	51	100	
J.S. ♂	12 yrs. 81½ lbs.	N	367	19	7.17	4.60	2.57	1.79	146	10.02	4.9	50	91	
H.T. ♂	7 yrs. 57¼ lbs.	S		26.4	6.8	4.16	2.64	1.58	216	11.3	4.8	53.2	91	17.9
H.P. ♂	7 yrs. 51 lbs.	N	359	20	7.02	3.49	3.54	0.98	244	10.1	5.1	52	89	
S.M. ♂	11½ yrs. 86½ lbs.	S		25.5	7.10	4.65	2.45	1.90	234	10.6	4.3	45.58	95	15.1
H.P. ♂	11½ yrs. 84 lbs.	N		23.7	7.21	4.53	2.65	1.69	153	11.0	4.7	51.7	89	16.7
Mean of Normal.....			361.25	24.56	7.07	4.01	3.09	1.35	203.18	10.27	4.77	49.31	91.51	19.12
Mean of Stutterer.....			364.14	22.57	7.00	4.06	3.02	1.40	217.55	10.35	4.53	46.98	91.66	17.76

*N = Normal, non-stutterer.
S = Stutterer

means differ significantly when calculated by the first method. When calculated by the second method there is an apparently significant difference between the means of the potassium values.

The stutterers in this case have a lower mean potassium value than the normal. This is in agreement with Kopp's findings. However, from a statistical point of view, this difference cannot be considered significant since in twenty-two calculations the possibility of one significant difference is likely to be due to pure chance. Furthermore, it is questionable whether the sensitive second method employed is completely justified. Although the controls were carefully selected, they did not represent ideal controls, such as identical twins, in whom stuttering may be the only differentiating characteristic.

Table IV represents the correlation coefficients of the same constituents as given by Kopp. None of the values show any statistically significant differences. Four out of six pairs of the correlation coefficients have the same sign. In the case of serum calcium and potassium and serum calcium and phosphate the relationship is of the opposite sign. But the correlation coefficients are so small that their difference is not statistically significant. Thus, in our observations we find no statistically significant differences between the blood pattern of normal and stuttering children.

The only lead gathered from our data is a possible difference in the potassium values. It should be made clear that we cannot state with any finality that there is no chemical difference between the blood of stutterers and normals. We can only say that in our particular samples there were no statistically significant differences.

Summary

A study was made of the chemical composition of the blood of stutterers and children with normal speech. Each stutterer was matched with a non-stutterer of the same age, sex, height, and weight. All the results fell within the normal range of the values established in our laboratory. There were no statistically significant differences between the results of the two groups except, perhaps, for potassium. The blood pattern of the stutterer as shown by correlations indicates no statistically significant differences.

The authors are indebted to Dr. S. Fabricant of the National Bureau of Economic Research for his analysis of the statistical material, and to Miss Gertrude Miller of Brooklyn College for assistance in the preparation of the manuscript.

TABLE III

STATISTICAL TEST OF DIFFERENCES BETWEEN STUTTERERS AND NORMALS

	Cl.	N.P.N.	Tot.Prot.	Alb.	Glob.	A/G	Chol.	Ca.	Phosp.	Ca. x P.	Sugar	K.
Difference (in mg./100 cc.).....	+2.57	−1.98	−0.068	+0.051	−0.073	+0.051	+14.37	+0.075	−0.242	−2.33	+0.25	−1.38
*$(N_1-1)+(N_2-1)$	13	22	22	20	20	20	20	22	22	22	22	11
t.....	0.894	1.082	0.282	0.448	0.365	0.313	0.9002	0.383	1.66	1.46	0.0454	1.25
P.....	0.39	0.291	0.78	0.66	0.72	0.76	0.38	0.705	0.114	0.137	0.96	0.24
**N–1	6	11	11	10	10	10	10	11	11	11	11	5
t.....	1.324	1.073	0.488	0.481	0.512	0.593	0.832	0.456	1.975	2.080	0.812	4.18
P.....	0.238	0.31	0.636	0.642	0.621	0.568	0.426	0.658	0.078	0.065	0.436	less than 0.01

"P" gives the frequency with which a value of "t," as great or greater than that observed could result from chance alone. The convention is to consider the difference between the means significant when $P < 0.05$.

N_1 = Total Number of Stutterers.

N_2 = Total Number of Normal Non-stutterers.

N = Total Number of pairs of Stutterers and Normal Controls.

* = First Method.

** = Second Method.

TABLE IV
SUMMARY OF SIMPLE CORRELATION COEFFICIENTS

	NORMAL	STUTTERER
Total serum calcium and potassium	+0.257	−0.283
Total serum calcium and phosphate	+0.0332	−0.210
Total serum calcium and total protein	−0.082	−0.523
Potassium and phosphate	+0.438	+0.404
Potassium and total protein	+0.097	+0.237
Phosphate and total protein	+0.029	+0.640

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MEASURES OF JAW MOVEMENT AND PHONATION IN NON-STUTTERED AND STUTTERED PRODUCTION OF VOICED AND VOICELESS PLOSIVES*

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ALTHOUGH there has been no research on the problem, it has been believed generally and taught universally that a definite order of movement of the mechanism used in the production of speech takes place in the production of the voiced and voiceless plosives. The typical opinion of students of speech is that during the production of the voiced plosive voicing takes place for a short interval preceding any movement of the mechanism. The author has been unable to find in the literature data on the temporal relationship between voicing and this movement. In the case of voiceless plosives, there is assumed to be no phonation, but a release of the breath stream after the mechanism has been set in motion.

This study was undertaken in an attempt to gather data pertaining to the following questions:

1. What is the temporal relation between initiation of jaw movement[1] and the initiation of phonation in the non-stuttered production of (a) words with the initial voiced plosives b, d, and g; (b) words with the initial voiceless plosives p, t, and k? The word pairs used are homophones except for their initial sounds which are cognates.
2. What is the above relation in the stuttered production of the same words?
3. What is the duration of phonation in the stuttered and non-stuttered production of each word used in this study?
4. To what degree are there interruptions in phonation during the stuttered and non-stuttered production of these words?
5. What is the interval between initiation of jaw movement and

* All data pertinent to this investigation are on file in the Speech Clinic at the University of Iowa. The writer wishes to acknowledge the supervision of Drs. Wendell Johnson and Grant Fairbanks and the assistance of Miss Phyllis Franke.

[1] Unless otherwise specified, "jaw movement" in this paper refers to the movement of the jaw, from a position of complete closure, involved in the production of a word. The particular words spoken by the subject are indicated in the section on procedure.

the point of first change in direction of jaw movement in the records of non-stuttered words. Direction is considered with regard to the vertical plane; a change in direction is made from downward to upward, or vice versa, in terms of the records obtained. The direction is regarded as upward or downward whenever the angle between the base line (signal line) and the jaw movement line is ten degrees or more, and/or the extent of the movement is two mm. or more. This first change in direction coincides, in the non-stuttered production of any given word in this study with the transition from the vowel to the following consonant.

6. What is the frequency in directional changes of jaw movement during the stuttered and non-stuttered production of these words?

7. In what order do phonation and jaw movement occur?

Procedure

Apparatus. Recordings were made on a five-inch Renshaw polygraph[2] which had been reversed so it would pull instead of push the paper through the instrument, at the rate of 16 mm/sec.

The apparatus for recording jaw movement was a metal cup, which contained a movable metal tambour, so devised as to compensate for excessive movement which might rupture the tambour head. This was held on the head by means of a head-phone band and so arranged that the rubber diaphragm of the tambour covered the point of the chin. This device was connected pneumatically by means of a rubber tube to a Marey recording tambour which activated a syphon pen.

The voice key has been described by Koepp-Baker.[3] It consisted of a Shure crystal pick-up cartridge, the out-put from which was amplified by a 2-stage amplifier with a gain of 60 decibels. The out-put from the amplifier was used to activate an overbiased triode in the plate circuit of which was a sensitive relay. A syphon pen was soldered to the armature of the relay to indicate movement of the armature. A large-headed upholstering tack was inserted in the needleholder of the pick-up. This was used to pick up the vibration of vocal cords as transmitted to the thyroid cartilage. The pick-up was held in place by an elastic strap attached to which was a sponge cushion forming a pocket for the pick-up.

[2] C. H. Stoelting Co., 424 N. Homan Ave., Chicago, Ill.

[3] Koepp-Baker, Herbert, *An Electrical Phone-Kinesograph and Its Application in the Study of Speech*, Ph.D. Thesis, State University of Iowa, (1938).

The polygraph also was equipped with a signal key which could be operated by means of a telegraph key by the subject.

Cards on which were typed the words used in the experiment were fastened together by means of rings so they could be turned like the leaves of a book.[4]

peep	pit	pet	tick	tuck	tyke	cat	cut
beep	bit	bet	dick	duck	dyke	gat	gut
peak	peg	pack	tab	tote	cab	cob	could
beak	beg	back	dab	dote	gab	gob	good
peat	peck	tip	tub	tout	cap	cot	
beat	beck	dip	dub	doubt	gap	got	

Subjects. There were two groups of subjects: (1) ten normal speakers, advanced graduate students and members of the Speech Department in the State University of Iowa, who displayed no signs of malformation of the mechanism, ranging in age from twenty-two to thirty-two years; (2) ten stutterers, who displayed no signs of malformations of the mechanism, and who were doing work in the Speech Clinic at the State University of Iowa, ranging in age from eleven to thirty-three years.

Experimental Procedure. The subject was seated at a table with his back to the polygraph and the experimenter and asked to read the following instructions. The instructions were read aloud by the experimenter to the younger subjects.

1. First, I shall explain how you are to use the signal key. (Experimenter shows subject how the key is operated.) You will speak several words, one at a time. You will expose the words one at a time by turning these cards. Do not expose a word until you are ready to say it, that is, do not be saying, or preparing to say one word and be looking at another. You may expose a word and look at it as long as you like until you are ready to say it. When you are ready to say a word press the key and turn to the next card.

2. You are ready to say a word if you have your teeth completely together so that the jaws are fully closed. (Experimenter has subject determine just what this position is for him. Subject is then asked to expose several trial words in order to ascertain whether he understands instructions to this point.)

3. You are to say each word with normal distinctness and at a normal rate, starting, as I have shown you, from closed-jaw position.

[4] List of words used in experiment.*

* Taken from *Voice And Articulation Drillbook* by Grant Fairbanks, Athens Press, Iowa City, (1937).

If you feel that you have failed in any respect to do this, press the key twice. Then, after a short pause and when you are ready, give the "ready" signal, and say the same word again. The point is to have each word spoken according to the instructions.

4. If you think you have stuttered on a word, press the signal key three times just as soon as you have finished saying the word. *Do not press the key while you are saying the word.*

5. If I think that you might have stuttered on a word, and you do not signal that you have, I shall say to you, "Think carefully about that last word, and if you think you stuttered on it, signal now to show that you did. *But do not signal unless you are positive that you stuttered.*"

The jaw movement recording device was placed on the subject, being adjusted to give the maximum sensitivity. With the subject's jaws closed, the experimenter connected the rubber tubing between the device and the recording tambour. The voice key was strapped around the subject's neck so that the contact point rested on the lamina of the thyroid cartilage. The amplifier then was adjusted so as to pick up any vibration that the subject might produce with his vocal cords. Each subject was run twice, with an interval of fifteen minutes to twenty-four hours between runs.[5] The apparatus was disconnected after each run.

To establish the reliability of the experimenter to read records, both runs of three cases were read twice and the following results were obtained:

	Record I			Record II		
	N	Med.	90%	N	Med.	90%
Case 1	141	.00	.5mm	141	.00	.00mm
Case 2	141	.00	.5mm	139	.00	.5mm
Case 3	138	.00	.5mm	141	.00	.5mm
Total	841	.00	.5mm			

These figures represent the median size of the differences between the first and second measurements of identical records, and also the ninetieth percentile of these differences. That is, in fifty per cent of the measurements no error was made, and in nine out of ten measurements the error—*i.e.*, the *difference* between the first and second measurements—was 0.5 mm. (0.0313 sec.) or less.

Summary of Results.[6]

1. The time elapsing between the initiation of jaw movement and

[5] Two of the stutterers were each run once.

[6] All data and computations are on file at the State University of Iowa.

the initiation of phonation is shorter for non-stutterers than stutterers in both voiced and voiceless sounds. The values are greater in the case of the voiceless sounds for both groups.

In some cases the standard deviation is as large or larger than the mean. This is due to the fact that the corresponding distributions were skewed, usually by only a few extreme measures.

2. The time between the initiation of jaw movement and the initiation of phonation is greater for the stuttered than for the non-stuttered words of stutterers.

3. Significant differences were found with respect to the time interval between initiation of jaw movement and initiation of phonation between the following compared measurements (the higher value characterizes the first noted member of each pair).

Voiced

a) Stutterers' words, first run; non-stutterers' words, first run.
b) Stutterers' stuttered words; all non-stutterers' words.
c) Stutterers' non-stuttered words; all non-stutterers' words.
d) Stutterers' stuttered words, first run; stutterers' non-stuttered words, first run.
e) Stutterers' stuttered words, second run; stutterers' non-stuttered words, second run.

Voiceless

a) Stutterers' words, first run; non-stutterers' words, first run.
b) Stutterers' stuttered words; all non-stutterers' words.
c) Stutterers' non-stuttered words; all non-stutterers' words.
d) Stutterers' stuttered words, first run; stutterers' non-stuttered words, first run.
e) Stutters' stuttered words, second run; stutterers' non-stuttered words, second run.

4. The duration of phonation is longer for stutterers than for non-stutterers for both the voiced and voiceless words.

5. The duration of phonation is longer for the stuttered than the non-stuttered words of stutterers.

6. Significant differences were found between the following compared measures (higher value characterizes the first noted member of each pair), with respect to the time interval of phonation.

Voiced

a) Stutterers' words, first run; non-stutterers' words, first run.
b) Stutterers' stuttered words; all non-stutterers' words.
c) Stutterers' stuttered words, first run; stutterers' non-stuttered words, first run.
d) Stutterers' stuttered words, second run; stutterers' non-stuttered words, second run.

Voiceless

None.

7. The stutterers was the only group that showed any interruption in phonation while saying the studied words. The non-stutterers had only a single phonation in each word, while the stutterers had one or more.

8. The time elapsing between the initiation of jaw movement and the first directional change is greater for stutterers than non-stutterers in all cases.

9. The time elapsing between the initiation of jaw movement and the first directional change is greater for the stuttered than for the non-stuttered words of stutterers in all cases.

10. Significant differences were found between the following measurements with respect to interval between initiation of jaw movement and first directional change (higher value characterizes the first noted member of each pair).

Voiced

a) Stutterers' words, first run; non-stutterers' words, first run.
b) Stutterers' stuttered words; all non-stutterers' words.
c) Stutterers' non-stuttered words; all non-stutterers' words.
d) Stutterers' stuttered words, first run; stutterers' non-stuttered words, first run.
e) Stutterers' stuttered words, second run; stutterers' non-stuttered words, second run.

Voiceless

a) Stutterers' words, first run; non-stutterers' words, first run.
b) Stutterers' stuttered words; all non-stutterers' words.
c) Stutterers' non-stuttered words; all non-stutterers' words.

d) Stutterers' stuttered words, first run; stutterers' non-stuttered words, first run.

e) Stutterers' stuttered words, second run; stutterers' non-stuttered words, second run.

11. The directional changes of jaw movement are greater in number in the stuttered than non-stuttered words of stutterers.

12. There are a greater number of directional changes in the voiced than in the voiceless words for non-stutterers.

13. Significant differences were found between the following compared measurements with respect to the frequency of directional changes in jaw movement.

Stutterers

Stuttered voiced words; non-stuttered voiced words. Stuttered voiceless words; non-stuttered voiceless words.

Voiced

Stutterers' stuttered words; all non-stutterers' words.

Voiceless

Stutterers' stuttered words; all non-stutterers' words.

14. In the stutterers' production of 392 words with initial voiced consonants, jaw movement preceded phonation in 374 instances, and in 13 instances jaw movement and phonation were initiated simultaneously. In the stutterers' production of 392 words with initial voiceless consonants, jaw movement preceded phonation every time.

15. In the non-stutterers' production of 446 words with initial voiced consonants, jaw movement preceded phonation in 394 instances and in 30 instances jaw movement and phonation were initiated simultaneously. In the non-stutterers' production of 446 words with initial voiceless consonants, there were two cases when initiation of jaw movement and phonation were simultaneous, and in all other cases jaw movement preceded phonation.

Summary

In general, the following characterizes the stutterer, as compared with the non-stutterer:

1. Longer time between initiation of jaw movement and initiation of phonation.
2. Longer duration of phonation.
3. Greater number of interruptions in phonation.

4. Longer time between the initiation of jaw movement and first directional change of jaw movement.
5. Greater number of directional changes in jaw movement.

The above holds true in general, also, for the stuttered words as compared with the non-stuttered words of stutterers.

With few exceptions, in the non-stutterers' and the stutterers' production of words with initial voiced consonants and of words with initial voiceless consonants, initiation of jaw movement precedes the initiation of phonation.

ANALYSIS OF PROGRAMS OF STUDY AND DEMANDS OF TEACHING POSITIONS OF M.A. GRADUATES IN SPEECH

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AN INVESTIGATION was undertaken recently at the State University of Iowa to answer certain pertinent questions regarding the administration of the master's degree in speech through an examination of the records of students who received the degree from that institution. Some of the questions raised were: What undergraduate preparation has the student brought to his graduate program in speech? Has he had certain basic courses in his field of major interest? Has he had substantial training in related subjects and background areas? Has his graduate program consisted of a comprehensive study of the whole field of speech and related subjects, or has he tended to concentrate in a single area within the department? What part of his graduate program has he devoted to thesis? What type of position has he taken upon graduation, what were the demands of the position, and how well have his undergraduate and master's programs prepared him to meet them?

The Problem

The problem had a three-fold aspect: (1) to describe and evaluate the undergraduate preparation of candidates for the master's degree, (2) to examine their graduate preparation and obtain a complete record of their training in the major field, in related subjects, and in general background courses, (3) to investigate the professional record of those candidates who became teachers; to ascertain what courses they were required to teach; and to compare the demands of the first positions taken after the master's degree with the preparation of the students prior to receiving that degree.

Group Selected for Study

The group selected for study consisted of 321 persons, 161 women and 160 men, who received the master's degree in speech over a period of eighteen years from 1921 to 1938. Over one-third of the candidates were drawn from institutions located in Iowa; seventy-four were graduates of the University of Iowa. Students, however, presented undergraduate degrees from 128 institutions in thirty states, over 80 per cent of the group earning the Bachelor of Arts degree or some modification of it.

Procedure

Available were 303 undergraduate transcripts and 313 graduate transcripts; these were analyzed and related courses grouped together in the following areas of concentration:

Area One: *a*) Basic courses in speech, including such courses as are designed to prepare the student to meet everyday speech situations.

b) Basic courses in voice, including such courses as voice and phonetics, voice improvement, experimental phonetics, acoustics, anatomy of the vocal organs.

Area Two: Public Speaking, including such courses as public speaking, debate and argumentation, public discussion.

Area Three: Radio.

Area Four: Dramatic Interpretation, including such courses as dramatic interpretation, interpretative reading, story telling, acting, directing, dramatic production.

Area Five: Technical Production, including such courses as stagecraft, scene design, costume design, make-up, stage lighting, light and color.

Area Six: Dramatic Literature, including all courses in dramatic literature as well as courses in history of the theatre, dramatic criticism, and playwriting.

Area Seven: Teachers' Courses, including all courses dealing with methods of teaching speech.

Area Eight: Speech Correction, including such courses as speech pathology, clinical methods, and speech correction.

For the purpose of analyzing the spread of the students' preparation in speech and closely related fields and the spread of teaching, courses in certain of these areas were grouped together as follows:

Group A. (Fundamentals and Public Speaking), including courses in Areas One and Two.

Group B. (Interpretation and Theatre), including courses in Areas Four, Five and Six.

Group C. (Speech Correction), including courses in Area Eight.

Courses were identified by means of the records on transcripts and descriptions in college catalogs; sixty letters were written to registrars for additional information. Credits received in the various departments and areas were totaled and frequency distributions of the totals were made for each area. Medians were computed to describe the preparation of the typical student.

The graduates themselves were requested for information concerning their first and their present positions. Of the record blanks mailed out, 235 were returned; 200 persons who were teachers listed subjects taught in the first position after the master's degree, and 167 indicated subjects taught in present positions.

Results

The typical student, as described by the median, brought to his program of graduate study 25.7 hours of undergraduate preparation in speech and closely related fields, of which the greatest amount of credit (6.4 semester hours) was earned in the area of dramatic interpretation; he acquired also 4.2 hours in the area of public speaking, and 4.1 hours in dramatic literature. In spite of the fact that the typical student received 4.1 hours of credit in dramatic literature, medians for distributions of credits earned in Shakespeare and in modern drama were extremely low (0.8 and 0.4 respectively), which

TABLE I

MEDIANS COMPUTED FROM THE DISTRIBUTIONS OF UNDERGRADUATE CREDITS IN SPEECH EARNED BY STUDENTS WHO RECEIVED THEIR MASTER'S DEGREES IN SPEECH FROM THE STATE UNIVERSITY OF IOWA (1921–1938)

AREA OF STUDY	MEDIAN IN SEMESTER HOURS OF CREDIT
Dramatic Interpretation	6.4
Public Speaking	4.2
Dramatic Literature	4.1
Basic Courses in Speech	0.4
Basic Courses in Voice	0.4
Teachers' Courses	0.4
Technical Production	0.4
Radio	0.3
Speech Correction	0.3

data would suggest that students can not be counted on to bring credits in these courses.

Medians of distributions of credits received in basic courses in speech and voice, teachers' courses, technical production, radio, and speech correction were extremely low also, one-half of the group doing no work of consequence in these areas during their undergraduate period. It is apparent that these students did not present a well-balanced undergraduate program in speech, nor did students enter upon their graduate program equally well prepared. Of the greatest significance is the wide variation in the amount of undergraduate training which the candidates received, the range extending from no undergraduate speech training in the case of three students to 66 hours of undergraduate training.

The typical student brought 17.6 hours of undergraduate credit in English exclusive of dramatic literature, 14.5 hours in social sciences, 13.4 hours in modern language, 12.8 hours in science and mathematics. In the tangent areas of art, music and the dance, extremely low medians for the distributions of credits earned, in each case the median being 0.3 hours, seemed to indicate either lack of interest on the part of speech students or possibly lack of opportunity to enter courses in these fields. On the other hand, 50 per cent of the students completed more than 5.5 hours in psychology, exclusive of credits earned in educational psychology and tests and measurements. All but 15.5 per cent of the group completed some undergraduate work in education and 50 per cent of the students received more than twelve hours of credit in general education and practice teaching, an

TABLE II

MEDIANS COMPUTED FROM DISTRIBUTIONS OF UNDERGRADUATE CREDITS EARNED BY STUDENTS WHO RECEIVED THEIR MASTER'S DEGREES IN SPEECH FROM THE STATE UNIVERSITY OF IOWA (1921–1938)

AREA OF STUDY	MEDIAN IN SEMESTER HOURS OF CREDIT
Speech	25.7
English	17.6
Social Sciences	14.5
Modern Language	13.4
Science and Mathematics	12.8
General Courses in Education	12.0
Psychology	5.5
Philosophy and Religion	3.2
Special Methods (excepting in Speech)	0.4
Classical Language	0.5
Music	0.3
Dance	0.3
Art	0.3

TABLE III

TOTAL GRADUATE CREDITS IN SPEECH[1] (EXCLUSIVE OF THESIS CREDITS) EARNED BY STUDENTS WHO RECEIVED THEIR MASTER'S DEGREES IN SPEECH FROM THE STATE UNIVERSITY OF IOWA (1921–1938)

CREDIT HOURS	FREQUENCY	CREDIT HOURS	FREQUENCY	CREDIT HOURS	FREQUENCY
23–24	30	41–42	2	59–60	1
21–22	24	39–40	2	57–58	
19–20	33	37–38	5	55–56	1
17–18	34	35–36	4	53–54	
15–16	22	33–34	10	51–52	1
13–14	16	31–32	20	49–50	
11–12	6	29–30	27	47–48	1
9–10	5	27–28	26	45–46	4
7–8	5	25–26	33	43–44	1
5–6	1				

Number: 313 Modes: 24, 26
Range: 6–60 Median: 23.6

[1] Speech includes work in the eight areas of concentration.

indication of an early interest in teaching as a career. In addition, over one-half of them completed courses in special methods of teaching some subject other than speech. The median for a distribution of credits earned in courses in methods of teaching speech was 0.4, suggesting that generally students do not bring credit in this field.

The typical student completed his graduate program at the age of twenty-seven to twenty-eight years, after having had about three years of teaching experience. The median for a distribution of graduate credits earned in speech and closely related fields was 23.6 semester hours with the typical student receiving the greatest amount of credit (4.3 hours) in dramatic literature and substantial amounts in other areas as follows: basic courses in voice, 2.5 hours; dramatic interpretation, 2.8 hours; technical production, 2.5 hours; teachers' courses, 1.9 hours; speech correction, 2.4 hours. Extremely low medians for distributions of credits in the areas of public speaking, basic courses in speech, and radio suggest that the typical student did little graduate work in these fields. Medians for distributions of credits obtained by students who received their master's degrees during the last ten years (1929–1938) reveal that recent graduates have tended to receive less credit in basic courses in voice, the median being 1.9 hours; in the following areas the medians for distributions of graduate credits received by recent graduates were slightly higher: technical production, 4.5 hours; teachers' courses, 2.4 hours; speech correction, 3.6 hours.

The typical student acquired 85.3 per cent of his graduate credit in courses in speech and closely related fields and in thesis seminars. Of the work done in other departments of the Graduate College, 47.2 per cent was in English and 29.9 per cent in psychology; of the other credits earned outside the department, 9.0 per cent was in education, 4.9 per cent in social sciences and 4.7 per cent in science and mathematics. Less than one per cent of the credit was acquired in art and no graduate credit was received in courses in music.

All students who have received the master's degree in speech have submitted theses in partial fulfillment of the requirements for the degree, all but three earning graduate credit for work on research problems. The typical student received 6.2 credits for thesis, but in some instances the credit ranged as high as fifteen hours. It is of considerable significance that, of their graduate credits in speech and closely related fields, one-half of the entire group obtained more than 21.0 per cent for work on research problems.

Graduate students have spread their programs broadly over the

TABLE IV

GRADUATE CREDITS EARNED IN THESIS AND RESEARCH BY STUDENTS WHO RECEIVED THEIR MASTER'S DEGREES IN SPEECH FROM THE STATE UNIVERSITY OF IOWA (1921–1938)

CREDIT HOURS	FREQUENCY	CREDIT HOURS	FREQUENCY	CREDIT HOURS	FREQUENCY
5	39	10	23	15	4
4	28	9	15	14	4
3	18	8	33	13	3
2	18	7	39	12	7
1	4	6	61	11	8
0	9				
	Number 313		Mode: 6		
	Range: 0–15		Median: 6.2		

field; of the 313 students whose records were studied, 265 or 84.7 per cent received credit in two or more of the main groups of courses: fundamentals and public speaking, interpretation and theatre, and speech correction; 35.7 per cent spread their study over three groups. Fifty per cent of the students spread programs over four or more of the eight areas of concentration; 50 per cent received three or more hours of credit in at least three of the eight areas.

When distributions were made of the totals of undergraduate and graduate credits in each field, a wide variation was found in the amount of training received by graduates in speech, total credits in

TABLE V

MEDIANS COMPUTED FROM THE DISTRIBUTIONS OF TOTALS OF UNDERGRADUATE AND GRADUATE CREDITS IN SPEECH AND CLOSELY RELATED AREAS EARNED BY STUDENTS WHO RECEIVED THEIR MASTER'S DEGREES IN SPEECH FROM THE STATE UNIVERSITY OF IOWA (1921–1938)

AREA OF STUDY	MEDIANS IN SEMESTER HOURS OF CREDIT
Dramatic Interpretation	10.2
Dramatic Literature	9.1
Public Speaking	5.6
Technical Production	4.3
Basic Courses in Voice	4.2
Speech Correction	3.6
Teachers' Courses	2.9
Basic Courses in Speech	0.5
Radio	0.3

undergraduate and graduate courses (exclusive of thesis seminars) ranging from thirteen to ninety-four hours. Medians of distributions of credits in the areas of dramatic interpretation and dramatic literature were 10.2 hours and 9.1 hours respectively; the median for a distribution of credits in the area of public speaking was 5.6 hours and medians for distributions in other areas were less. The typical student did no work of consequence in basic courses in speech and in radio, but earned at least 2.9 hours of credit in all other areas.

Upon the completion of their master's programs, 92.8 per cent of the two hundred graduates reporting entered the teaching profession; the number employed in institutions of higher education was greater than the number in secondary and elementary schools in the ratio of three to two. It was the practice of graduates in their first positions after receiving the master's degree to teach courses in at least two of the three main groups of courses in speech and related fields and to offer work in some other department as well. Eight persons taught speech correction only, twenty-two fundamentals and public speaking only, and twenty-five interpretation and theatre only; 72.5 per cent of the two hundred graduates indicated that they taught courses in two or more of the main groups within the field and 50 per cent that they taught speech in combination with subjects in other departments, 64 per cent of the number teaching in other departments combining speech with English and 12 per cent more combining speech with English and other subjects.

The spread of teaching over the eight areas of concentration varied widely. However, the typical student taught in two areas, supervised activities outside the classroom in two areas, and either supervised outside speech activities or taught in three. All but twenty-three of the teachers supervised speech activities outside of the classroom in at least one area of concentration; 45.2 per cent of such activity was in play production and 30.4 per cent was in debate.

The teaching combination of Group A (Fundamentals and Public Speaking) and Group B (Interpretation and Theatre) occurred in 49 per cent of the positions with 14.5 per cent more requiring work in Group C (Speech Correction) as well. Next in order of frequency were the following: Group B only, Group A only, Group A and Group C, Group C only, Group B and Group C. The number teaching in but one of the groups made up 26.9 per cent of the two hundred persons concerning whom information was available.

Of courses taught, over two-thirds were in three areas: basic speech, public speaking, and dramatic interpretation. In first positions more persons were teaching in the area of dramatic interpretation than in any other; the number without preparation was small. However, of the 117 persons who were teaching basic courses in speech, 53 per cent had had no experience in similar courses prior to receiving the master's degree; 24.2 per cent of the teachers reporting were without courses in methods of teaching speech at the completion of their master's program.

Of the two hundred graduates, 42 per cent were teaching in at

least one area of concentration and eight per cent were teaching in two areas with undergraduate preparation only prior to the master's degree; 38 per cent were teaching in at least one area without having included any preparation in that area in either their undergraduate or master's programs.

Conclusions

The following conclusions may be drawn from the data submitted in this investigation:

1. Since 92.8 per cent of the graduates reporting on first positions after the master's degree indicated that they entered the teaching profession, it is evident that the master's degree in speech at the University of Iowa is primarily a teachers' degree and the graduate program a teachers' training program.

2. Since teachers have been required generally to spread their teaching over at least two of the three groups of courses: Fundamentals and Public Speaking, Interpretation and Theatre, and Speech Correction, it may be well in most cases to urge students to avoid concentrating in narrow areas before they have made a comprehensive study of the whole field.

3. Since the amount of the students' undergraduate preparation in speech and related fields varied greatly, it would seem advisable, if the master's degree is to stand for a certain level of achievement, that in most cases students whose undergraduate credits fall far below the amount earned by the typical student make up certain work in addition to the 30-hour minimum required for graduation.

4. Since one-half of the M.A. graduates in speech have been required to combine the teaching of speech with classes in other departments, students should in most instances plan their programs to enable them, if necessary, to teach in some other field.

5. Since students can not be counted on to earn undergraduate credits in the areas of basic courses in voice and basic courses in speech, any work which the student is expected to cover in these areas should be offered at the graduate level.

6. Since the amount of graduate credit for thesis was in some instances out of proportion to the amount of credit earned in speech and related fields, it would seem that in all but exceptional cases the proportion of the graduate program devoted to thesis might be limited in order that students may spend a larger part of their programs in courses that will prepare them for teaching.